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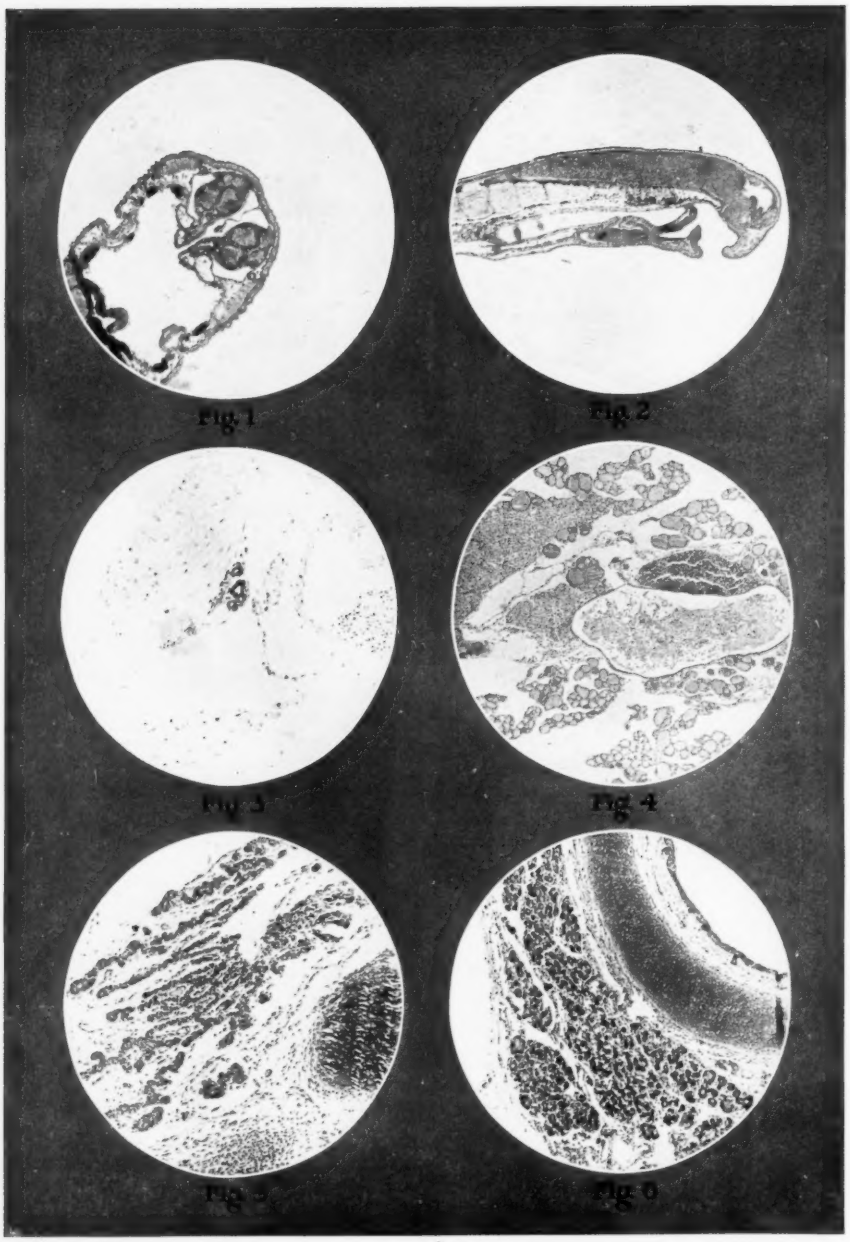

Some Errors in the Development of the Thyroid Gland.—J. N. J Hartley.

SURGERY, GYNECOLOGY AND OBSTETRICS

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SOME ERRORS IN THE DEVELOPMENT OF THE THYROID GLAND

BY J. N. J. HARTLEY, F.R.C.S., EDINBURGH, SCOTLAND
From the Clinic of Sir Harold J. Stiles

EMBRYOLOGISTS and comparative anatomists, by their researches on the pharynx, have not only revealed a most fascinating story, but have also done much to elucidate the subject of developmental errors in this region of the body. In particular, light has been thrown on the congenital abnormalities encountered in the thyroid gland, and, prior to detailing certain illustrative cases, it will be well to review very briefly the salient points of the normal evolution of the thyroid and of its associated branchiogenetic organs.

PHYLOGENETIC HISTORY

The thyroid gland is present in all vertebrates and even in the most primitive is composed of closed vesicles containing so-called colloid material. Moreover, throughout the vertebrates, the thyroid takes origin, for the most part if not entirely, from a median anlage which grows down from the ventral wall of the pharynx.

In the lamprey (Figs. 1 and 2), during its long larval stage, the thyroid rudiment remains a bilobed structure with a patent duct leading to the pharynx, and the thyroid only assumes the familiar vesicular characters at the metamorphosis, when the sexual organs become mature. Incidentally, it may be mentioned that, from a comparative study of the fœtal lamprey (ammocœte) and some of the higher intervertebrates, Gaskel (1) was led to believe that the thyroid of vertebrates is the modified utriculus of the ancient palaeostracean. Some would find in this an explanation of the functional relationship known to exist in mammals between the thyroid gland and the genital organs.

Low down in the vertebrate series, various organs are seen to arise from the pharyngeal pouches. From the fifth pouch, a diverticulum develops which becomes the ultimobranchial or postbranchial body and is first to be seen in the fishes (elasmobranch) (2). Still higher in the vertebrate series, namely, in the amphibians, epithelial or parathyroid bodies arising from the third and fourth pouches are added. It is of interest to note that the parathyroids only develop in the larval amphibian when the gills atrophy and the lungs begin to function (3).

Fig. 1. Larval lamprey (ammocœte). Transverse section, showing the bilobed thyroid with a patent duct leading to the pharynx.

Fig. 2. Larval lamprey (ammocœte). Longitudinal section passing through a lateral lobe of the thyroid and the patent thyroid duct.

Fig. 3. Thyroid of the tadpole. Longitudinal section through lateral lobe of thyroid.

Fig. 4. Photomicrograph of thyroid of cat, showing the epithelial duct of Pepere and along with it a lymphatic nodule and the fourth epithelial body all embedded within thyroid tissue.

Fig. 5. Photomicrograph of thyroid of human fœtus (30 millimeters). The epithelial cells are in irregular cords and have not yet broken up into isolated alveoli.

Fig. 6. Photomicrograph of isthmus of human fœtus (3 months). Showing primitive follicles, some containing a little colloid.

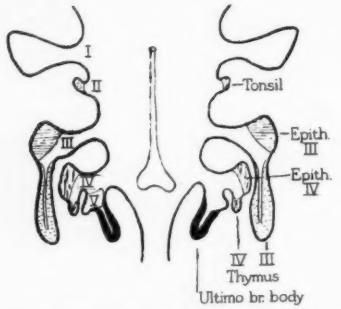

Fig. 7. Schema of the branchiogenetic organs in man. (Keibal and Mall.)

In reptiles and birds, all these branchiogenetic organs are present but remain separate from the thyroid gland. Even in that primitive mammal, the echidna, so carefully studied by von Maurer (3), the parathyroids and the postbranchial bodies do not come into close relation with the thyroid, though the postbranchial diverticulum gives rise in this animal to an organ composed of vesicles lined by columnar cells.

In certain mammals, the derivatives of the fourth and fifth pouches form at one stage a "complex," consisting of the fourth parathyroid, a thymic rudiment from the fourth pouch, and the postbranchial body. The complex becomes closely united with the lateral lobe of the median thyroid, and, as was first observed by Woelfler in 1880 and subsequently by Stieda in 1881 and Born in 1883, the tissue of the postbranchial body and that of the median thyroid actually fuse. The postbranchial body then became known as the lateral thyroid anlage, and was assumed to participate in the formation of functionating thyroid tissue. It will be readily understood from the above why the fourth epithelial body is usually closely related to the thyroid and why in certain animals, such as the cat, dog, and rabbit (2), it lies embedded in the lateral lobe. In the cat, there is constantly to be found associated with the internal parathyroid, a cyst-like structure, no doubt the remains of the postbranchial body, and often, along with this, is a nodule of thymic tissue (4), (Fig. 4).

Phylogenetically, therefore, the median thyroid was by far the first to appear. Later

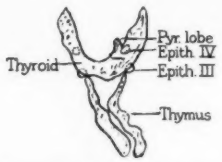

Fig. 8. Branchiogenetic organs. Embryo, 26 millimeters, simplified. (Verdun—from Keibal and Mall.)

arose the postbranchial body and then the parathyroid. In mammals, the fourth parathyroid and the postbranchial bodies have become closely related to the median thyroid. So intimate is the fusion of the postbranchial tissue with the median thyroid that it has led certain observers to believe that in mammals the thyroid is derived not only from the median but also from the so-called lateral thyroid rudiments. It may be observed that this growing together of ductless glands of different embryonic origin is seen likewise to occur in the pituitary and in the suprarenal bodies.

ONTOGENETIC HISTORY

In the human embryo, the median anlage occurs at a very early stage (Broman, 5, 2.5 millimeters) as an evagination from the mesial portion of the ventral wall of the primitive pharynx. The evagination quickly develops into a sac, the orifice of which opens on the summit of the tuberculum impar and then migrates backward to its posterior boundary furrow: the pouch becomes bilobed and travels caudally.

The thyroglossal duct, which for a time has a double lumen, atrophies, and soon the thyroid breaks its connection with the pharynx (7 to 8 millimeters, Broman). The organ then becomes a broad structure composed of irregular cords of cells disposed for the most part transversely (Fig. 5). In a 50-millimeter vertex breech embryo, some of the thyroid cords develop lumina, become beaded, and soon thereafter break up into rudimentary follicles (Fig. 6). Probably for some time after birth, the formation of thyroid continues. Iodine, which is so characteristic of the adult thyroid, is not present until some months after birth.

From the dorsal part of the third branchial pouch, the third epithelial body arises, while,

from the ventral portion, the greater part if not all of the thymus is developed. When the thymus migrates caudally, it carries along with it the third epithelial body, which in man is left eventually in the vicinity of the lower pole of the lateral lobe of the thyroid. It is of interest to note that this parathyroid in the sheep and goat is normally embedded in the thymus (6).

The fourth and fifth pharyngeal pouches, as in lower mammals, give rise to a "complex" consisting of the fourth parathyroid, a thymic rudiment, and the postbranchial body. The fourth parathyroid in man normally remains outside the thyroid gland. The fate of the postbranchial body is not easy to decide, and indeed, according to Grosser, Lewis (7), and McMurrick, has not yet been observed through all its phases. As already stated, the researches of Woelfler, Stieda, and Born on certain mammals led to the belief that in man probably a portion of the lateral lobes of the thyroid was derived from the ultimobranchial bodies. No less an authority than Broman (1912) writes that in man the lateral thyroid rudiments develop acini, and, in the third month, can no longer be differentiated from the median thyroid tissue. The prevailing opinion, however, would appear to be that no proof exists of functionating thyroid tissue being derived from any other source than the median pharyngeal rudiment. As will be seen later, there is some clinical evidence which supports this point of view.

The relation between the median thyroid rudiment and the branchiogenetic derivatives is a subject which here needs no further consideration. It may be mentioned, however, that it is one full of interest when dealing with the histogenesis of various types of thyroid neoplasm. Thus, the fœtal adenoma has been said to arise in thyroid rests, whereas the para struma or the *glykogenhaltige* struma was thought by Langhans to be derived from the parathyroids, and the *kleinalveolaere groszellige* struma or the struma postbranchialis of Getzowa has been supposed to take origin from postbranchial body remnants (8, 9). The cases of squamous epithelioma on record may quite well have arisen from some persistent branchiogenetic tissue, though Nicholson (10) has recently shown that chronic inflammation itself may possibly be the means of transforming ordinary thyroid tissue into epithelial prickle cells.

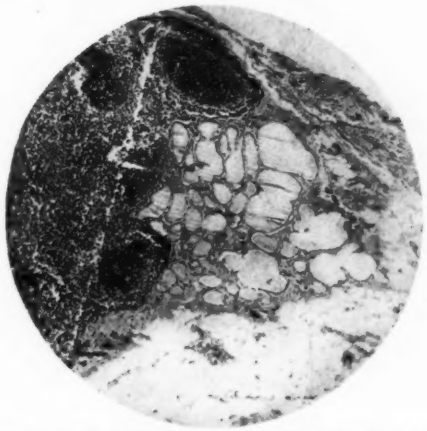

Fig. 9. Islet of thyroid tissue, accidentally found in a submental lymph gland removed by Sir James Hodsdon at an operation for carcinoma of the lip. (Dr. Reynolds.)

DEVELOPMENTAL ERRORS

Irregularities in the development of the branchiogenetic organs associated with the thyroid are of little surgical moment. Thymic nodules with accumulation of lymphocytes and the presence of Hassall corpuscles have been observed embedded in the human thyroid, and are supposed to be derived from the fourth branchial body (11). The fourth epithelial body, which is normally within the lateral lobe of the thyroid, in the cat, dog, and other animals, is said rarely to be embedded in thyroid tissue in man.

Congenital abnormalities arising from maldevelopment of the pharyngeal thyroid rudiment are more important, and almost every conceivable type has been described. The thyroid gland may be completely absent, and, in not a few cases, the only vestige of thyroid has been a cyst or an irregular cystic mass in the vicinity of the foramen cæcum (12).

Migration of the thyroid caudally may be arrested in any part of its usual course and then gives rise to a true ectopia thyroidis. Most frequently the thyroid then lies in the substance of the tongue or under the lingual mucosa. Less frequently the thyroid is centrally placed below the hyoid bone.

Accessory thyroids are probably far more common than is generally supposed, and are due to the aberrant growth of primary

Fig. 10. Case 1. Miss L. S., 7 years before operation.

thyroid tubules. Though accessory thyroids usually lie in the vicinity of the thyroid gland, they may be present anywhere in the thyroglossal tract, or may wander to more remote regions. As an example of the laterally placed accessory thyroid, one may cite the case recorded by Paton (10). In a girl aged 15, a thyroid growth the size of a walnut lay between the sublingual gland and the mylohyoid muscle. In a case recently operated on by Sir James Hodsdon for epithelioma of the lip, an islet of thyroid tissue was accidentally found in a lymph gland immediately behind the symphysis menti (Fig. 9). The gland was about the size of a pea. So far as could be ascertained, the thyroid gland was normally situated in the neck.

Another group of abnormalities is associated with the thyroglossal duct. As already stated, thyroid tissue may occur anywhere in this tract, and, in a large proportion of cases, such thyroid tissue, at its lower extremity, constitutes the lobus pyramidalis. On the contrary, no thyroid tissue may be formed from the thyroglossal duct itself until it has bifurcated, in which case the isthmus is absent and the lateral lobes are separate, as they normally

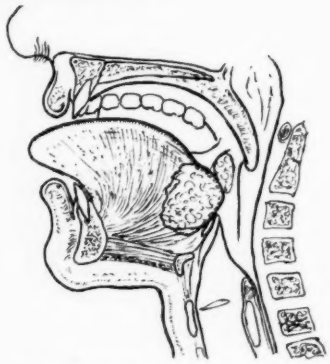

Fig. 11. Diagram to show situation of lingual thyroid in Case 1.

are in birds, reptiles, and some other mammals. Or, one of these bifurcations may atrophy, and then only one lateral lobe is present. Finally, the thyroglossal duct may persist in whole or in part, and is then liable to form cysts, which may or may not erupt and develop into sinuses or fistulæ.

Probably, from the surgical point of view, the most important congenital abnormalities of the thyroid gland are the lingual thyroid and the thyroglossal cysts, and these will be dealt with more fully.

LINGUAL THYROID

Though a relatively rare condition, the cases on record are now sufficiently numerous to allow of generalized statements. Lenormant (14), writing in 1921, was able to refer to 43 cases in the literature. In only three were the patients males. Most frequently the symptoms became troublesome at puberty or during pregnancy. Spencer (12) removed from a baby 3 weeks old a lingual thyroid which gave rise to dyspnœa. Hickman reported that, in a baby only 16 hours old, a lingual thyroid caused death by asphyxiation (15).

Though usually deeply embedded in the root of the tongue, the lingual thyroid generally projects on the dorsum immediately in front of the epiglottis. The mucosa stretched over its surface may be normal and movable, but not infrequently presents dilated venules. Histologically, the tumor has the appearances of normal thyroid or of a parenchymatous or colloid goiter. The symptoms have been

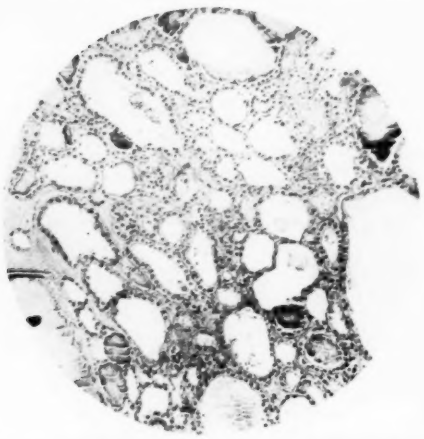

Fig. 12. Photomicrograph of portion of lingual thyroid removed from Miss L. S.

Fig. 13. Case L. S. After operation for lingual thyroid.

those of difficulty in articulation, difficulty in swallowing, and, in some, interference with respiration. In several, severe hæmorrhage has been the dominant symptom.

Of the various morbid conditions of this region that require to be differentiated, mention may be made of carcinoma, sarcoma, and gumma, all of which are more rapid in their development. Angiomata are more spongy and compressible, whereas the dermoid cyst is, as a rule, more tense.

An important question to decide, as will be shown later, is whether the lingual tumor is a true ectopia thyroidis or merely an accessory thyroid. Though not conclusive, the absence of a palpable isthmus is evidence in favor of the swelling being a true ectopia of the thyroid gland.

CASE 1. *Lingual thyroid.* Miss L. S., age 30, complained of hoarseness, difficulty in swallowing, and, recently, attacks of choking.

History. Since patient can remember, she has been "hoarse," and her friends have always noted that she spoke with a nasal intonation. At puberty, the hoarseness became worse, and at this time she began to cough up glairy sputum, which she thinks came from her throat and not from her chest. She was treated from time to time with gargles, but the hoarseness and cough persisted. At the age of 20, she found occupation as a saleswoman in a store, and this entailed considerable talking, which patient thinks aggravated the cough, the expectoration of mucus, and the hoarseness, and she often found that, in the evenings, the throat was very dry and uncomfortable. For fully 10 years she has experienced difficulty in swallowing. During this time she has had to cut her bread up into small squares free from crust, and to eat her food very slowly. She says that she feels as if what she eats "catches on a ledge," and it is only with an effort that the food can be made to pass the "ledge."

Recently, the hoarseness and difficulty in swallowing have become worse, and she has developed what she describes as "choking attacks." Without any assigned cause, she suddenly feels some obstruction in her throat and for several minutes thereafter can breathe only with great difficulty. It is these alarming attacks of choking sensation which have caused the patient again to seek medical advice.

Physical examination. Patient speaks with a distinct nasal intonation and there is difficulty in articulation. Though the patient is small in stature, her appearance does not suggest any hypothyroidism. Her hair is long, curly, and glossy and she is proud of the fact that it reaches below the buttocks. The tongue can be protruded with ease, and, when the dorsum is displaced with a tongue spatula, the rounded summit of a tumor is just visible on the posterior third of the tongue. The swelling can be readily palpated, and feels about the size and shape of half a large marble. It projects from the pharyngeal surface of the tongue immediately behind the circumvallate papillæ, and extends to near the base of the epiglottis. Its consistence is moderately firm

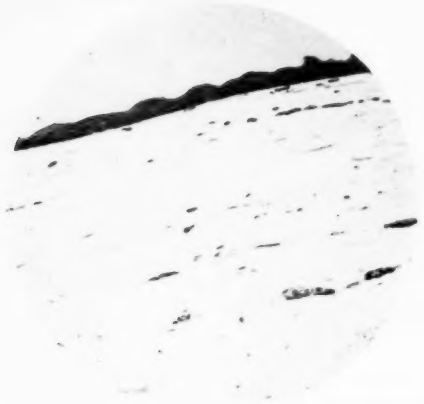

Fig. 14. Infrahyoid thyroglossal cyst. Photomicrograph of a portion of the cyst wall. (Case Miss Jessie M.)

rather than fluctuating. The mucosa moves slightly over the swelling, and, when inspected with the laryngoscope, is seen to be smooth, and, apart from the presence of a few dilated venules, appears normal.

On careful examination of the neck, no trace of thyroid isthmus can be felt, the upper tracheal rings being readily palpable to near the episternal notch. No lateral lobes can be detected—but this, of course, does not exclude their presence.

In view of the absence of the thyroid isthmus, the lingual tumor was thought to be an aberrant thyroid rather than a thyroglossal dermoid. As the symptoms had been steadily getting worse and producing distressing choking sensations, surgical intervention was deemed advisable.

Operation, January 14, 1921. Sir Harold Stiles.

Under ether anæsthesia by the intratracheal method, an attempt was made to gain access to the tumor through the mouth. This approach, however, was found inadequate, and the tumor was therefore dealt with through a medial suprahyoid incision. The mylohyoid raphé was divided, and, on separating the geniohyoid and the genioglossus muscles in the mid-line, thyroid tissue was encountered. By means of scissors, the tumor with its covering of lingual mucosa was excised, and this procedure was facilitated by an assistant pressing the pharyngeal portion of the tongue down from above. The wound in the mucous membrane and the various muscle layers were sutured with iodine tannic catgut and the skin closed around a small drainage tube.

Pathological report. The tumor removed was about the size of a large cherry: it was covered on one surface with non-ulcerated mucous membrane. Its cut surface presented areas like thyroid tissue and other areas of lingual muscle. There was no evidence of a capsule.

Histological findings. Showed the appearances of fairly normal thyroid tissue, some acini, however, being dilated and lined by flattened epithelial cells. The lymphoid follicles in the submucosa were well marked.

January 30, 1921. The wound having healed kindly and there being little or no difficulty in swallowing, the patient was allowed to leave the hospital.

On March 8, 1921 (8 weeks after operation), the patient reported. The hoarseness had disappeared and she could swallow quite well. It was noted that the face was a little swollen and there was a little œdema of the feet and ankles. On inquiry, patient stated that her hair was beginning to fall out. She was admitted to a Medical Ward on March 23, 1921, and the basal metabolism rate was found to be −20 per cent.

Her subsequent history is a long story. It is only necessary to state that she developed all the classical signs of myxœdema. The hair became short and brittle, and lost its curl and gloss. She had swelling of the face, swelling of the hands, feet, and ankles. She became apathetic, and lost her previous vigor. She states that she felt drowsy and could only rouse herself to do mental work with an effort. Thyroid therapy was instituted, and the condition became much better, the basal metabolism rate rising to −3 per cent.

An attempt was made, on February 10, 1922, to implant thyroid tissue removed at operation from a patient suffering from hyperplasia of the thyroid gland. It had been found previously, however, that the donor's blood was incompatible with the recipient's serum. Though there was temporary improvement, all the patient's symptoms recurred, and the basal metabolism rate fell to −30 per cent. Thyroid therapy had therefore to be resumed.

Fig. 15. Case 4. Thyroglossal sinus. (H. McL.) Shows orifice of sinus and the tract leading up to hyoid bone.

Though in this case the symptoms were sufficiently urgent to call for surgical intervention, the results of extirpation of the growth certainly were such as to justify the warning issued by Spencer (12) and others. In 1897, Siedowitsch (16) described a case in which myxœdema arose after excision of the lingual tumor, and, in the same year, a similar case was recorded from the clinic of Killian (17). C. H. Mayo (18) states that about one in seven cases operated on have been followed by manifestations of hypothyroidism. It must be urged, therefore, that in those cases where the normally situated thyroid gland cannot be detected, the surgeon should interfere only when marked symptoms arise, and, moreover, only a minimum amount of tissue should be removed.

It will be observed in the above case that the clinical manifestations ensuing were such as to suggest that virtually the whole of the thyroid gland possessed by the patient had been removed, and this opinion was strengthened by the great fall in the basal metabolism rate. Since there is no reason to suppose that in this patient there was any general factor inhibiting the formation of thyroid tissue, one must conclude that, normally, little or no thyroid tissue is formed from the lateral anlage, and this accords with the modern teaching of embryologists. For still further clinical evidence in favor of the thyroid being derived mainly from the median anlage, one may refer to cases on record in which the thyroid was absent or represented by a small nodule in the root of the tongue, and yet dissection revealed in the neck parathyroids and thymus with no vestige of thyroid tissue (12 and 21).

Fig. 17. Photomicrograph at *c*, Figure 16. Tract lined with columnar ciliated epithelium and walls heavily invaded by inflammatory cells.

Fig. 16 (at left). Thyroglossal tract removed by operation in one continuous piece. (Case H. McL.)

Fig. 18 (at right). Composite diagram of thirty serial vertical sections through the middle portion of the hyoid bone. It will be seen that the tract passes in front of the hyoid bone. (Case H. McL.)

It may be pointed out that, in the section (Fig. 12) of the lingual thyroid, there was considerable intervesicular tissue. Though it has been suggested that, in the normally situated thyroid, the intervesicular tissue may be of parathyroid origin, it could scarcely obtain in the lingual thyroid (11).

The following case of "lingual thyroid," hitherto unpublished, which I am able to refer to through the kind permission of Professor von Eiselsberg, is also an illustration of the true ectopia thyroidis.

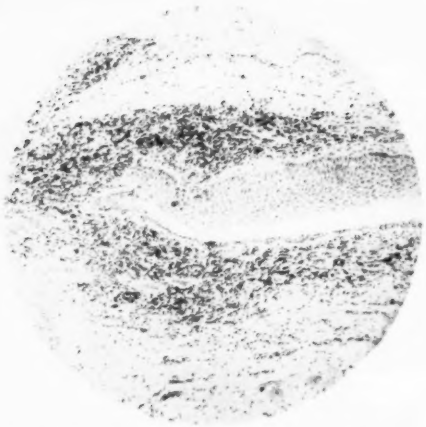

Fig. 19. Photomicrograph, vertical section of tract in front of hyoid bone at *b*, Figure 16, showing squamous epithelial lining. (Case H. McL.)

CASE 2. Female patient, age 22 years. Two years previously, had an attack of fever with difficulty in swallowing. It was noted by Dr. Kaiser that there was a swelling at the base of the tongue. Five weeks ago, in the region of this swelling, hæmorrhage occurred and this was so severe that the patient fainted.

On examination, no thyroid could be detected in the neck by palpation. In the middle line of the tongue, in the region of the foramen cæcum, a swelling about the size of a nut was palpable. By means of a laryngoscopic mirror, the surface of the tumor was seen to be bluish and semi-transparent, and shining through were several cysts. It was sharply defined from the epiglottis. The tumor was rendered visible without instrumental aid by pulling the tongue forward.

Operation, September 22, 1921. Professor von Eiselsberg.

A T-shaped incision with a horizontal limb above the hyoid bone was made. The muscles were detached for about 2 centimeters from the hyoid bone and the mylohyoid split in the mid-line. On separating these muscles there appeared tumor tissue in the root of the tongue. This was dissected out by blunt dissection, and, in so doing, the pharynx was opened. After arresting hæmorrhage, the divided muscles were sutured and the wound was closed. The tumor was found to be about twice the size of a hazelnut, of a grayish-red color. It looked like thyroid tissue; was moderately firm, and presented no visible line of demarcation between the tumor and the surrounding tissue.

Histologically, the appearance was that of thyroid tissue.

September 29, 1921. The wound had healed and there was no difficulty in swallowing.

THYROGLOSSAL CYSTS AND FISTULÆ

As already mentioned, the thyroglossal duct disappears at a very early stage of fœtal life. Portions, however, especially in the vicinity of the hyoid bone, may persist and give rise to cysts. Those above the hyoid bone are termed "lingual dermoids," and may project into the submental triangle or on the dorsum of the tongue. They are lined by columnar-celled or squamous epithelium. Those cysts arising below the hyoid bone are usually lined by columnar-celled epithelium, frequently ciliated. That stratified squamous epithelium, however, may constitute the wall of infrahyoid cysts, is evidenced by the following case:

CASE 3. *Thyroglossal cyst.* Jessie M., age 13 years, complained of swelling in the neck with discomfort in swallowing. *History.* Patient first noticed a small swelling in the middle of the neck about 3 years ago. The swelling gradually grew larger until it reached its present dimensions.

Physical examination. There is a visible swelling in the mid-line of the neck just below the hyoid bone. On palpation, it is found to be about the size of a marble; it is not tender. The skin is quite free, and the swelling can be moved from side to side but feels as if fixed by a pedicle to the middle of the hyoid bone. The swelling is tense and fluctuating.

Nothing abnormal can be detected in the thyroid or in the tongue.

April 29, 1921. Sir Harold Stiles. Under chloroform and ether anæsthesia, a short collar incision was made over the swelling, and, on dividing the deep fascia and retracting the anterior jugular veins and subjacent depressor muscles of the hyoid bone, a cyst was exposed. It was readily shelled out by blunt dissection save for the pedicle which joined it to the hyoid bone and which had to be cut through.

The wound healed *per primam*, and there has been no recurrence.

Pathological report. The cyst was about the size of a marble, thin-walled, and contained a creamy pultaceous substance. A section of the wall showed it to be lined with stratified transitional epithelium, outside of which there was a fibrous coat (Fig. 14).

Thyroglossal cysts most frequently make their appearance during the first two decades, and, though they may remain stationary for years, they tend as a rule to grow larger and are prone to become infected. Not infrequently the swelling is incised in the belief that it is an abscess arising from an infected lymph gland. In other cases the inflamed cyst erupts

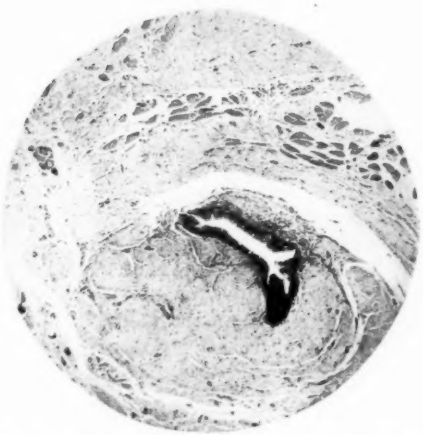

Fig. 20. Photomicrograph, transverse section of tract, immediately above hyoid bone at *a*, Figure 16. An islet of thyroid tissue—isolated vesicles containing colloid—is to be seen in the tissue. (Case H. McL.)

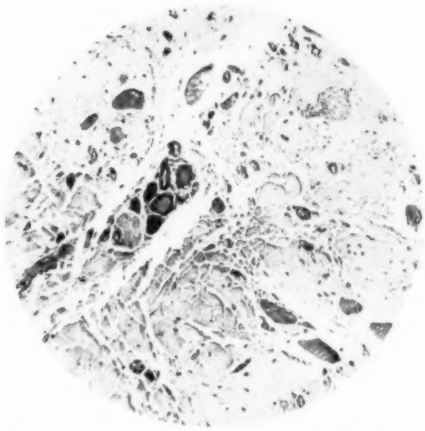

Fig. 21. The islet of thyroid tissue in Figure 20, more highly magnified.

of its own accord. The resulting sinus persists, or, if it closes, opens up again. Such a history is usually forthcoming in the so-called thyroglossal sinus and is illustrated by the following case.

CASE 4. *Thyroglossal sinus.* Helen McL., age 17 years, complained of discharging wound in the neck.

History. Since infancy, patient has had a swelling in the mid-line of the neck. At the age of 9 years, the swelling was the diameter of a penny and formed a visible swelling at the level of the thyroid cartilage. After that time the swelling gradually extended downward in the mid-line until it reached almost to the episternal notch. Two and one-half years ago, after an attack of influenza, a reddish blister appeared at the site of the swelling and soon thereafter a quantity of pus was discharged. The opening failed to close and has continued to discharge a mucopurulent fluid.

Physical examination. It will be seen from the photograph (Fig. 15) that a sinus exists a little above the episternal notch, a little to the left of the mid-line. The sinus admits a fine probe, and from the sinus there is a slight mucopurulent discharge. Extending up from the region of the sinus there is a firm, narrow band, readily palpable and extending to the middle of the hyoid bone. No abnormality can be detected in the thyroid or in the root of the tongue.

Operation. January 26, 1922. Sir Harold Stiles. Under intratracheal anæsthesia, a transverse incision was made at the level of the hyoid bone, and a vertical incision down to and encircling the sinus. The flaps of skin and platysma were reflected and the sinus and fibrous tract were dissected up to the hyoid bone, it being found necessary to divide the deep fascia and to retract the depressor muscles of the hyoid bone. It was noted that the tissues in the immediate vicinity of the tract were vascular. As the fibrous band obviously did not end below the hyoid bone, it was thought advisable to resect the middle portion of the hyoid and to search for a tract leading up to the foramen cæcum. The middle portion of the hyoid bone was freed by dividing it with bone forceps on either side. The mylohyoid raphé was split above the hyoid, and, on dissecting between the geniohyoid and the genioglossus muscles, a fibrous band could be traced almost to the foramen cæcum. The whole tract was removed *en masse.* The remaining portions of the hyoid bone were sutured together with iodine tannic catgut and the various muscles brought together, a small drain being left in at the lower angle of the wound.

February 8, 1922. The wound was practically healed and the patient was allowed home.

Pathological report. The specimen removed is shown in Figure 16. It will be seen to consist of the infrahyoid tract, the middle segment of the hyoid bone, and a tract leading up to near the foramen cæcum. A microscopic section of the band immediately above the orifice of the sinus (Fig. 17) demonstrates that the sinus was lined by columnar-celled epithelium, in certain parts several cells deep. Around the epithelial lining there is fibrous tissue infiltrated with inflammatory cells. Serial sections were cut from the middle portion of the hyoid bone, and a composite diagram of 30 of these is shown (Fig. 18). It will be seen that the sinus passes up in front of the hyoid bone and is fused to the anterior aspect of the hyoid by dense scar tissue. Histological sections (Fig. 19) demonstrated that in this region

the tract was lined with squamous epithelium. It is interesting to note that in this vicinity a small islet of thyroid tissue with vesicles of colloid formation was present (Figs. 20 and 21). In the suprahyoid portion the sections revealed nothing but dense fibrous tissue.

It will be observed that in this case the tract passed in front of the hyoid bone. More frequently, the tract has been observed to lie dorsally to the hyoid bone (Gilman, 20, and Marshall) or has been gripped between the two rudiments of the body of the hyoid (18). Experience has shown that after excision of thyroglossal cysts the condition is very liable to recur, presumably owing to epithelial remnants being left in or around the hyoid bone. It is, therefore, advisable, whenever a cyst is found anchored to the hyoid, to remove the middle portion of that bone and to search for a tract leading up to the foramen cæcum. Such a procedure can be carried out with safety, and is generally admitted to be the only means of ensuring a radical cure.

CONCLUSIONS

1. Embryological researches have led to a better comprehension of the various congenital abnormalities encountered in the thyroid gland.

2. A lingual thyroid in many cases is a true ectopia thyroidis and then represents the whole of the acting thyroid tissue of the body.

3. This is clinical confirmation of the modern embryological teaching that the thyroid derives no functionating tissue from the ultimobranchial body.

4. The absence of a palpable isthmus in the pretracheal region is strong evidence of such a lingual swelling being an ectopic and not an accessory thyroid.

5. When a lingual thyroid gives rise to symptoms demanding surgical intervention, a minimal amount of tissue should be removed, and the surgeon should be prepared to adopt thyroid therapy if the clinical symptoms or the basal metabolism rate indicate a state of hypothyroidism.

6. The so-called "infrahyoid" type of thyroglossal cyst not infrequently has an epithelial prolongation upward, either through, behind, or in front of the hyoid bone, and, to ensure non-recurrence, it is advisable, when the pedicle can be traced to this bone, to resect the middle portion and to search for a tract leading to the foramen cæcum.

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THYROTOXIC ADENOMA, WITH REMARKS ON BASAL METABOLISM IN THE DIAGNOSIS OF GOITER[1]

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THE thyroid gland is the dictator of evolution. It is doubtless responsible for the change of amphibians into land animals. A Mexican water-newt breathing through gills when fed on thyroid develops into a terrestrial salamander, with typical mottled skin and aerated through well developed lungs. The size of the gland increases from fishes to larger amphibians and reptiles, is larger still in birds and mammals, reaching the acme of development in man, in whom it is the dominant gland with its effect upon sex, upon intelligence, and upon personality. The active principle of the thyroid secretion is a governor on the metabolic engine. It is the most important of the accessories of the internal combustion engine of the human mechanism, and in the preparation of the food of the body for making its energy it may be likened to the carburetor. Kendell and Plummer at the Mayo Clinic showed that less than one grain of thyroxin doubles the amount of energy as determined by the metabolic rate. On the contrary, the deprivation of thyroxin as in the cretin who is born without a thyroid, renders him apathetic, dwarfed, idiotic, and sphinx-like. When thyroid extract or its principle is administered it is well known that these pitiful little caricatures of humanity wax and grow marvelously.

In the acquired deprivation of the secretion of the thyroid as in myxœdema there is a drying of the body and of the mind, but this in turn disappears under the magic of thyroid administration. Without the thyroid, therefore, there is no growth, no thought, and no reproduction of species.

Exophthalmic goiter, which is dependent upon an excess of the secretion amounting to a poison, speeds up the entire body mechanism and makes the engine race. The exophthalmic is driven by an invisible whip. When the symptoms are full-blown the patient presents the typical expression of the staring countenance and the bulging eye, goiter and tremor. So strong is the heart-throb that the vibration is imparted to the entire body; even the plume on the hat of its victim is agitated.

In addition to the exophthalmic or hyperplastic goiter there are two other clinical varieties: The colloid goiter, the simplest example of which is the goiter of adolescence, which is a work hypertrophy and disappears without treatment or with iodine. If a goiter persists for a good many years, the probabilities are that it is not of the colloid type, but rather an adenoma which is the second variety. It will not disappear of its own accord or under the influence of iodine like the colloid goiter. If the adenoma persists after the age of 25 then an operation will be required. The interesting feature about the adenoma is that if patients continue to carry them, a very considerable percentage will develop hyperthyroidism when they are between 35 and 40. Just what stimulates this apparently innocent adenoma into pathological activity that gives rise to the severe symptoms of hyperthyroidism is not known. In spite of the warning of Kocher and many of the earlier writers on goiter, iodine is often erroneously given to elderly women with long-standing goiter. It will very frequently over-stimulate the gland and produce a hyper-secretion with marked toxic symptoms. It has been referred to as a Basedowified goiter and so definite is the relationship that it is denominated "iodine goiter." The adenomata with hyperthyroidism never develop the prominent exophthalmic eye. We formerly characterized these cases as pseudo-exophthalmic and also non-toxic exophthalmic goiter, but as a matter of fact they are all adenomata and have a tendency to hypertension. They present the tremor and

[1] Read by title at the Tennessee Medical Society at Memphis, April 13-15, 1922.

the tachycardia just as in the exophthalmic and also the loss of weight and strength. Aside from the eye symptoms the main difference is that the exophthalmic goiter seems to expend itself upon the nervous and muscular systems in a very brief time, one or two years; whereas with the adenomata a goiter may have been in existence 14 or 15 years before heart changes manifest themselves as a myocardial degeneration. The patient has carried the goiter so long that when the heart symptoms dominate the clinical picture, goiter is sometimes lost sight of as the etiological factor. Very often the heart muscle will be found in an advanced degree of degeneration. This is not surprising when we consider the time that has elapsed in which this damage could occur as a result of the heart strain from the excessive amount of thyroid secretion. Perhaps the first thing the patient notes wrong in addition to the loss of weight, is that the heart beats faster and harder and that dyspnœa occurs on climbing stairs, and palpitation when in repose. The symptoms come on gradually at first with a little nervousness and the patient is more or less easily excited. There is usually hypertension. This same group of toxic symptoms may be produced by over-feeding thyroid extract, as in "obesity cures," but the symptoms soon disappear when the administration is discontinued.

The exophthalmic goiter comes at a younger age, say 30 to 35, and reaches the maximum of its first curve of severity at or about the end of the first year.

Of the adenomatous goiters about one in five develops the toxic symptoms of hyperthyroidism. With such a definite fixed chance against an individual the question may be asked: "What does it profit a person to carry a goiter of this type around for 15 or 20 years before coming to operation?" Judd found that even after the hyperthyroidism developed an average of 2½ years of symptoms elapsed before operation. Even at that, it is not quite as sad as our exophthalmic cases, because while we get some cases early, as a matter of fact, only about one out of three is sufficiently early to permit of the radical operation at one sitting. The other 66⅔ per cent have been allowed to become so toxic that thyroidectomy cannot be safely performed but they should have a ligation first of one superior thyroid artery and then the other, in order to get a sufficient margin of safety within 2 or 3 months for the removal of the goiter.

The greatest problem in the treatment of goiters is the estimation of the degree of toxicity that exists in a given case. Formerly we relied entirely upon clinical symptoms which gave us many valuable signs of thyroid toxæmia and disturbed metabolism; but we had no accurate index as we have in other diseases, for example, the white blood count in appendicitis and the urinalysis in diabetes. Now we are able to state the degree of toxicity in figures and not only this but we can say how much improvement has been accomplished by our therapeutic measures. We study very carefully the fever chart in infectious diseases. In nephritis the blood-pressure and nitrogen retention and blood urea are estimated. Why should we not follow just as diligently heat production? For in certain diseases we find an enormous heat production without any rise in temperature. This heat production has just as definite a clinical bearing as does body temperature. Body temperature can be determined in a very short time with a thermometer, but heat production can be measured only by a special apparatus.

Although basal metabolism in diagnosis is subject to error, it is probably as reliable as many of our other laboratory measures. Dr. DuBois makes a statement: "But why," says the practitioner, "should I who have seen hundreds of cases, go to all this trouble when I can perfectly well tell from a clinical aspect whether or not the metabolism is increased?"

Such guessing is very common, quite fascinating, and not risky for one's reputation unless the results are checked. On the other hand, those clinicians who have checked up their results in a large number of cases, realize the frequency of their errors, especially in atypical cases, and are not at all surprised if they are not always able to approximate the true figure.

The basal metabolism rate is of great value in hyperthyroidism as it is distinctly a disease of hypermetabolism. It is much more depend-

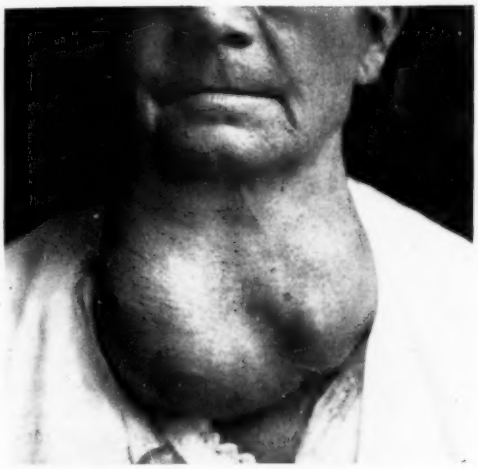

Fig. 1. Multiple symptomless adenoma; patient aged 61. Duration 22 years.

Fig. 2. Same patient 8 years after. The adenoma has become toxic. Basal metabolism rate, + 55 per cent; pulse, 140.

able than the blood-sugar curve or the adrenalin test. What advantage does it give us? It helps to separate neurasthenia, cardiac neuroses, effort syndrome, neurologic states which so often simulate hyperthyroidism, from true toxæmia, in that their metabolic rates are within normal limits.

It is of further value in determining a patient's ability to undergo surgical procedures. It will accurately compute varying degrees of severity and will be another aid to the surgeon, in conjunction with other symptoms, in determining whether he should ligate one pole or both poles, or whether partial thyroidectomy should be resorted to in the very beginning. It is of marked value in the determination of the time to proceed with partial thyroidectomy following preliminary pole ligation. In our experience with the metabolic tests, it has changed our methods of handling some of the cases. It is a good plan to estimate the rate every two weeks if possible. A certain patient may pass the maximum gain of improvement before the customary three months' delay after ligation before thyroidectomy.

The first work that was done revealing the importance of metabolism in diseases of the thyroid was performed by Friedrich Muller in 1893. He discovered that his patient lost in weight, although on a diet greater than normal.

DuBois in a careful observation upon patients with hyperthyroidism was able to show that very severe cases of hyperthyroidism had an increase of 75 or more over the normal average, severe cases 50 over, milder cases or moderate cases under 50.

Metabolism of an individual is variable, due to many factors. There is some variation with sex and also height. Thin people produce more heat than fat and young persons more heat than old people. Sleep, digestion, psychic anxiety, and exercise all influence metabolism. It has been established now that the level of a person's metabolism while at rest and after 12 to 18 hours' starvation is constant, varying only with certain factors such as age and body surface. This is known as the basal metabolism, and has been defined by Lusk as "the minimum of energy compatible with cell life."

Relative to body surface a guinea-pig and an elephant have the same basal metabolism.

By measuring the rate of oxygen intake and multiplying this by the caloric value of a litre of oxygen at the respiratory quotient, the ratio of the quantity of oxygen consumed to the quantity of carbon dioxide eliminated, we determine the patient's basal metabolism rate. When such a machine as Benedict's and others have been perfected, the determination will be just as simple as the blood-pressure reading and the metabolism level is the best functional test of thyroid over-productivity and intensity.

The average metabolic rate in the exophthalmic cases is + 66 per cent according to Boothby and after ligation it goes down to + 50 per cent. Within from 2 to 4 months they improve so much that it comes down to + 42 per cent, and then the final operation is done, followed by a fall to + 19 per cent; but only one-third of the patients return to normal in 2 weeks and one-fourth of them still remain above 30 per cent.

With the adenoma with hyperthyroidism, however, the average metabolic rate has been found to be 35 per cent, and falls after operation to + 7 per cent; in the majority it reaches normal within 2 weeks after the operation.

It is pretty certain that one cannot go wrong in the diagnosis if the basal metabolism rate estimation is taken into consideration together with the other symptoms.

The surgery of mildly toxic goiters is most gratifying. These severe cases test one's knowledge to its capacity and one has to use great care and judgment with practically every expedient to get them to a point where it is possible to do any surgical procedure. Every agent that can possibly be brought into play should be used in nursing these patients back to health. Rest and quiet are helpful. Advantage should be taken of even the slightest improvement. This safe point is very difficult to judge despite all your records, as pulse-rate, gain in strength and weight, as well as lowered metabolic rate. It is difficult to tell what a given myocardium or enfeebled nervous system will bear.

We should be very careful not to bring the surgical treatment of goiter into disrepute. Quite often neurasthenics with slightly enlarged thyroids have been operated on with the thought in mind of curing them of their nervousness, when as a matter of fact, there is no relationship of cause and effect. Fortunately for us, differentiation can now be made by objective tests, such as the basal metabolic rate.

On the other hand, it is not always realized that in the purely medical treatment of toxic goiter we are dealing with an intense intoxication that is being disseminated throughout the entire body in all of the organs and all of the tissues setting up secondary pathological changes that may be very severe and sometimes permanent and often fatal. The toxicity seems to expend itself upon the myocardium, the cerebrum, and the nervous system. The muscular system is very greatly affected as manifested by the extreme weakness and the entire body mechanism is so interfered with that great emaciation often occurs. When the nervous system is involved in an organic way, the functions of the stomach and intestinal canal are so altered that vomiting and diarrhœa are very grave indices of an advancing and threatening toxæmia and are sometimes fatal. The myocardium is perhaps one of the earliest structures to suffer and certainly the most unfortunate. The "goiter heart" of the old authors is well known. With the genuine toxic type it is accentuated sometimes to the nth power. Is it not better to anticipate this severe complication, in all adenomata, by early operation? Kocher called attention to the danger of malignant degeneration of goiters in patients over 35.

Cerebral irritation is often manifested by peculiarities and vagaries that are quite unlike the usual quiet calm of the individual. The disposition often becomes irritable. We have seen real mania as a terminal and fatal symptom. The first surgical consultation was years too late. In toxic goiter, surgery is prophylactic and should be instituted at the earliest possible moment in order to curtail the disastrous effect upon the various organs, structures, and functions of the body.

Inasmuch as the over-production of the thyroid secretion, no matter what its intricate

and complex cause may be, is the real agent in the production of the toxæmia, our efforts should be directed to diminish the amount of secretion. Rest in bed and the tonic effect of cold over the præcordia are the simplest measures and the best drug to control the heart is digitalis. These measures, however, are temporary and our dependence must be placed in some surgical measure permanently to reduce the amount of thyroid secretion. In the ligation of the two poles of the thyroid, we practically cut down its blood supply, and therefore its resulting capacity for production of thyroid juice is practically one-half. In the grave cases, however, even a ligation under local anæsthesia has its dangers. In our earlier work, before surgeons were able to protect the patient by careful methods of preparation, perfected technique, and an acquired judgment as to the time to intervene, the death rate from this simple procedure was over 3 per cent; now it should be reduced almost to the minimum by the nicety of judgment and the exquisite care that is utilized in the handling of these cases. It becomes a game in which our results are measured by the skill and judgment of the operator. The goal is to deliver each patient in a safe manner from his excessive overproduction. Mayo, with his enormous experience, judgment, and skill, has been able to approach perfection in the management of these cases; and Crile, by his commanding wizardry in obtaining the object of the surgical endeavor has placed the surgical treatment of toxic goiter among the scientific triumphs of the age. When once the diagnosis of toxic goiter is made, what does it profit a patient to delay? Is it not wiser, as in appendicitis, when the diagnosis is made, to remove easily and quickly and for all time the offending organ and to forestall all complications and disasters? This is a simple rule of surgery that is applicable to this murderous disease.

We have used X-ray to a certain extent to prepare patients for an operation. It has about the same effect as a ligation and can be sometimes employed in cases that are almost too sick for ligation. We have seen but one permanent cure following the use of the X-ray without operation. It is impossible to estimate accurately the amount of radiation it will take to destroy sufficient of the cellular elements to stop the hyperthyroidism. If we give a little bit too much we get a myxœdema, if we give too little we do not relieve the patient. It is at best a *modus vivendi* remedy and great care should be exercised in its indiscriminate use in such an important structure as the thyroid gland. The same may be said of radium which is even more powerful and quite difficult to regulate in its dosage and effect, which effect if an over-dosage is very difficult or impossible to recall.

It must be remembered that an operation is not an emergency measure in toxic or exophthalmic goiter. The sicker the patient the more dangerous the operation. Preliminary preparation, if judiciously carried out, will allow ligation and so improve the patient that at the end of two or three months, the lost body weight will have been regained and the basal metabolism rate will have been reduced to a safe limit, so that the complete operation may be done. Thus, preliminary ligation and careful preparation take the desperate cases out of the death class.

The utilization of the perfected method enunciated by Crile and the principles which he has elaborated are most interesting. The combined local and light gas-oxygen anæsthesia, really amounting to an analgesia, in which the patients are barely asleep and really can be recalled in a moment, as the anæsthetist carries on a quiet conversation in subdued tones with them, is ideal. The rapidity of operation and the avoidance of unnecessary trauma as a result of great delicacy and swiftness of touch are the desiderata.

The hardest thing to learn is not to do too much. A most excellent rule, therefore, is to stop the operation at any moment at which any fear is entertained as to the outcome. We will all be saved very mortifying experiences if this simple precaution is taken. It isn't because we don't know of the danger that we are in, but because we think we can get by. When in doubt, stop. The temporary packing open of the wound with gauze, as advocated by Crile, is really a life-saving measure in those desperate cases where the

prolongation may be the last or fatal straw. The wound can be easily and quickly closed that same day and if necessary the next day without any difficulty and with as little scar as one could desire.

The after-treatment in these cases is a question of months instead of weeks, and years instead of months. The mere removal of the cause of the poisoning does not repair the damage done to the vital organs and functions. He is the best surgeon who avails himself of the best medical care and physiologic management in the after management of these grave cases. In the technique one should always bear in mind that it is only essential to leave a small portion of the exophthalmic gland, but that portion should always be over the trachea along the posterior capsule. The trachea should never be bare and should not be tied because of the trouble with the phonation and swallowing and the likelihood of the development of bronchopneumonia. Furthermore, in the closure of a wide defect after bilateral resection, one could easily draw up the tissues too tightly, so that the larynx is interfered with; and in one such case our patient was only rescued from the impending suffocation by a tracheotomy on the table. This is bad surgery and could be avoided by proper care. Large lateral lobes and substernal goiters should not be rudely rolled out on the neck as they may quickly cause cyanosis. It is rather better to sever the gland at the isthmus as advocated by Balfour and then from its superior attachment and pull it up, as advised by Crile. To push it up takes the chance of rupturing delicate blood vessels and deluging the field with blood.

In view of the advanced, widespread terminal pathology which many goiter cases have in association, the severe reaction which patients manifest to all stimuli, surgical and psychic, the surgeon should be deeply imbued with the admonition, "Be ye wise as serpents; harmless as doves."

FRACTURES OF THE TIBIAL SPINE COMBINED WITH FRACTURES OF THE TUBEROSITIES OF THE TIBIA[1]

By JAMES WARREN SEVER, M.D., Boston

IT is stated in practically all the literature that fracture of the tibial spine is a rare type of fracture. In a recent discussion Sir Robert Jones (1) states that he has seen many cases, and believes that many have been overlooked in the past. The following cases have been discovered recently in a number of old X-ray plates about to be thrown away. They are of interest not only on account of the nature and the severity of the fracture as seen in the X-ray, but they are of interest as well in the character of the results in the cases which could be traced. These results are rather at variance with the statements usually made in regard to the prognosis in these fractures.

The disability which is supposed to follow these fractures, results from one of two causes, or both together; namely, rupture of one or both crucial ligaments, or bony blocking of the knee to full extension from a fragment. Great violence is necessary to cause rupture of both crucial ligaments, and may result only when there has been a complete dislocation in any direction of the knee joint.

Following rupture of one or both of the crucials, the knee is most unstable, and the tibia can be displaced forward in full extension if the anterior crucial is torn, and can be displaced backward with the knee flexed if the posterior crucial ligament is torn. Good function with only moderate disability is obtained in these cases following prolonged fixation in full extension. The ligament itself may be ruptured or its insertion with pieces of bone attached may be wholly torn loose.

In none of the cases which I have seen has there been any limitation of extension or flexion of the knee, and no undue mobility

[1]From the Orthopedic Clinic of the Cambridge Hospital, Cambridge, Massachusetts.

Fig. 1. Case 1. M. S. Note line of fracture into joint through external tuberosity of tibia producing knock knee. Tibial spine apparently intact. Roentgenogram taken November 11, 1915.

Fig. 2. Case 1. Showing condition of patient December, 1921, 6 years after Figure 1 was taken. Note filling in of line of fracture with cupping of external tuberosity of tibia.

except in the lateral direction. This increased lateral mobility occurred when the leg was fully extended, and in no case, even in weight bearing, contributed to the discomfort of the patient. It has been stated by both Jones (loc. cit.) and Kurlander (2) that the most constant sign of fracture of the spine of the tibia is an obstruction to full extension of the leg. This has not been true in this series, which may, however, be an exception to the usual rule.

Jones and Smith (3) offer the following classification of injuries of this type: (1) avulsion of the tibial spine or its internal tubercle, (2) fracture of the external tubercle of the spine, (3) injury to the spine combined with fracture of a tuberosity of the tibia.

1. Avulsion of the tibial spine or its internal tubercle is produced by violent tension on the crucial ligament, caused by inward rotation of the thigh and abduction of the lower leg.

2. Fracture of the external tubercle of the spine, was first described by Jones and Smith, and they report three cases—probably not connected with injury to the crucial ligament, and possibly caused by the sharp inner margin of the external condyle of the femur shearing off the external spine from behind, either by the femur being forced forward or the tibia being driven backward, with the lower leg outwardly rotated.

3. Injuries to the spine combined with fracture of one of the tibial tuberosities, usually the result of direct and severe violence.

S. Fosdick Jones (4) reports a case of fracture of the tibial spine due to direct violence, the end-result being a very nearly perfect knee following long immobilization. He also reviews the important literature on the subject.

Fowler (5) reports a case of fracture of the external tuberosity of the tibia associated with an external dislocation of the knee,

Fig. 3. Case 2. Note fracture of external tuberosity of tibia, and also of internal spine of tibia.

Fig. 4. Case 3. Note line of fracture transversely through head of tibia—internal tuberosity.

following a fall of about 3½ feet. The patient landed on his feet and then fell to the ground. The patient died 10 days later of pneumonia and at autopsy the knee joint showed the following condition: "The outer half of the head of the tibia was the seat of a comminuted fracture. The external lateral ligament was torn across, the anterior completely torn, the internal only partially ruptured. The anterior crucial ligament was torn and the posterior was intact."

CASE 1. M. S. age 26, female. See roentgenograms, Figures 1 and 2. Patient was knocked down by an automobile on October 20, 1915, and her right knee injured. She was taken to a hospital where her knee was immobilized. At that time the examination failed to show crepitus. The knee was swollen and tender, but could be flexed and extended fully.

An X-ray examination showed that the external tuberosity of the tibia had been fractured obliquely into the joint. The break apparently did not extend all the way through the tuberosity to the back of the bone, but involved apparently about the anterior two-thirds of the articular surface, which was displaced downward and outward. The line of fracture started very close to the spine of the tibia, and ran downward and outward. There was no apparent fracture of the spine itself.

I saw her first on December 11, 1915, and a week later applied a light plaster cast, the front of which was later removed so as to massage the leg and allow active and passive motion. The patient had an uninterrupted convalescence. The result at the time of her discharge was not a perfect knee, however, for she was left with a moderate degree of knock knee and considerable lateral mobility of the knee joint in an outward direction, combined with free outward rotation of the tibia. The question of how much this mechanical disability, from joint relaxation, can be controlled by muscular action is to be answered only by time and use. I doubt very much whether she will be very comfortable without some support under the inner edge of her shoe, so as to prevent, as much as possible, knock knee or subsequent joint strain. At present, December 14, 1921, she is walking on the leg without trouble, but stands with slight knock knee. There is normal motion in flexion and extension; marked lateral mobility in outward direction. Functionally a very good knee with no thickening and no fluid.

CASE 2. N. B., age 59, stevedore. Accident July, 1913, and patient fell about 4 feet landing on right knee. He was taken to a hospital where he had a cast applied which he wore about 2 months. Soon after taking off the cast, he had a caliper splint on

Fig. 5. Case 4. Note the complete fracture through the tuberosities of the tibia, and the head of fibula. Lateral view.

Fig. 6. Case 4. Anteroposterior view. Note comminuted fracture of head of tibia and fibula, extending into knee joint, involving external spine of tibia.

his leg for about 2 months without relief. He complained, when I saw him about 2½ years after the accident, of his inability to walk any distance without the use of a crutch or cane. Also that his leg was weak, painful, and easily tired. He has been unable to go back to his work as a stevedore since the accident.

Examination of the right knee showed that there was very little limitation of motion in flexion and none in extension. There was a moderate degree of knock knee on the right and more lateral mobility, particularly in abduction, than there should be. There was slight bony thickening about the external tuberosity of the tibia. The roentgenogram of the right knee joint showed that the injury had caused a fracture through the external tuberosity of the head of the tibia, extending into the joint, and causing a moderate downward and outward displacement and slope of the external articular surface of the knee joint. The spine of the tibia had apparently been involved also and presented some evidence of callous formation and displacement. See roentgenogram, Figure 3. The fracture apparently does not go completely through the articular surface but seemingly has taken off the anterior two-thirds back to the line of the fibula and extends inward to the inner edge of the spine of the tibia.

This change in the weight-bearing surface of the knee joint is the direct cause of the knock knee and joint strain. Whether an operation planned to restore the level of the joint surfaces and repair the crucial ligaments could be done without doing too much damage to the joint and possibly without any real benefit, I don't know. I imagine that considerable of the disability could be met and prevented by a Thomas sole and heel, and possibly quite as much accomplished as by an operation, except in some severe cases.

It is of interest to note that in this second case there has been and is no limitation of full extension of the leg of the thigh, which

Fig. 7. Case 5. Note comminuted fracture of spine of tibia, left, especially involving the external spine and external articular surface of the head of the tibia.

might be expected from the X-ray findings, showing such a marked change and callous formation in the spine of the tibia.

No operation was done on either of these cases, and they both have knock knees and strained joints. Both conditions, however, can probably be easily controlled by balancing the foot and leg in proper weight-bearing lines, without much difficulty.

CASE 3. A. R., age 45. This man fell a distance of about 60 feet, some 6 months ago. He was taken to a hospital where he stayed only about 2 weeks. There it was found that he had sustained a Potts fracture of the right ankle, a contusion of the right knee, a fracture of the head of the tibia on the left, and a contusion of the left shoulder. He wore a ham splint only on the left leg for about a month, since which time he has been walking about on that leg.

The leg now presents the following condition: There is some thickening about the internal tuberosity of the tibia with a distinct ridge to be felt where apparently the upper fragment had slipped forward slightly. Some of the swelling is undoubtedly due to callous formation. The patella is movable. There is no joint thickening and the leg can be fully extended, but can be flexed only to about a right angle. He can stand and walk well, and there is no knock knee or bow leg. Functionally he seems to have a pretty good leg with prospects of a better one.

This fracture was probably caused by direct violence, either by falling directly on the knee, or more likely by being struck by a timber or steel floor beam during the process of the fall. He has a perfect result from his Potts fracture on the other leg.

Roentgenogram (Fig. 4) shows on femur, in internal aspect of internal condyle a small bony exostosis. It shows also a transverse line of fracture through the head of the tibia beginning at the inner edge of the internal tuberosity and running downward and outward to the middle line of the shaft. There is a slight overlapping of the edges of the fragments. The spine of the tibia appears normal. There is also a fracture of a portion of the head of the fibula.

CASE 4. E. B. This woman fell down stairs September, 1913, and injured her left knee. She was taken to a hospital and X-rayed following which she wore a plaster cast 5 weeks. She then began to go about on crutches, and began to bear weight on the leg with a cane in January, 1914. The cast was applied with the leg in full extension, December, 1921. Since the accident she says that the leg gets tired after being on it all day, but otherwise does not bother her. She stands with a moderate knock knee. There is a knock knee evident with the leg fully extended without weight bearing; considerable lateral mobility in the outward direction; no forward or backward mobility of the tibia or the femur in flexion or extension; and some bony thickening about the head of the tibia. She considers that she has a perfect result. (Figs. 5 and 6.)

CASE 5. A motorman, age 39, hurt his left knee in a playful scrap with another man on May 21, 1916. His left foot caught in a rail with a high flange on it, and he felt something snap in his knee as he turned. He was unable to bear weight on his leg for 4 weeks. I saw him at the end of that time. His knee was then swollen, full of fluid, and painful in attempted motion, especially in lateral directions. His leg was put in a splint. He was given baking and massage. He was seen September 14, 1916, at which time, about 4 months after the accident, he had normal flexion and extension of the leg, and was back at work. He was last seen December 14, 1921. He stated he had had no trouble for 2 years with the leg. He was working steadily as a motorman. The knee could be flexed and extended fully without pain or discomfort. There was no marked lateral mobility. The result was a perfect functional knee. There was no knock knee. The X-ray showed a fracture of the spine of the tibia, especially the external one. (See Fig. 7.)

CASE 6. A. L., age 47. Patient fell down stairs May 7, 1913, and injured the right knee. Roentgenograms taken May 9, 1913, showed a fracture of the internal tuberosity of the head of the

Fig. 8. Case 6. Lateral view. Note fracture just below tuberosities of tibia.

Fig. 9. Case 6. Anteroposterior view. Note line of fracture extending down shaft of tibia; also comminuted fracture of spines of tibia.

tibia as well as a fracture of both the tibial spines. She was in a plaster cast until July 18, 1913, following which she wore a bandage. On August 18, 1913, the note was made that the knee showed great limitation of motion, and was painful, but that she was walking without crutches. (See Figs. 8 and 9.)

Patient seen again in January, 1922, about 9 years after the accident. Perfect motion in knee joint, no disability, no knock knee, no joint relaxation, and perfect function. X-ray showed practically a normal knee joint with a little irregularity of the joint surfaces, and the patient stated that her knee did not bother her in any way whatsoever and had not for several years.

CASE 7. N. D. This man, age 42, was injured June 20, 1921, by being run over by a wagon. The wheel passed over his right knee, causing a comminuted fracture of the end of the femur and head of the tibia, as well as amputating two toes on his left foot.

I saw him first on September 13, 1921, at which time he had a moderate amount of motion in the knee with considerable lateral mobility. He was last seen December 21, 1921. He bends the knee to a right angle. He has full extension, with slight tendency to hyperextension. The postcrucial ligament is probably intact as there is no motion of the tibia forward or backward with knee flexed. With knee extended the tibia slides forward and backward on the femur as a result of the apparent rupture of the anterior crucial ligament. The tibia rotates freely outward, with only a slight lateral mobility. The weight-bearing position is excellent. Patient walks with slight hyperextension of knee. The X-rays show the fracture into the knee joint with injury to the internal tubercle of the spine and fracture of the head of the tibia. (See Fig. 10.)

CASE 8. C. H., age 56. He stated that he was injured on November 21, 1916, when he jumped from a cart and broke his right leg. He has been walking around on the leg using the leg as much as he can, and on account of pain and limitation of motion he is unable to go back to work at his previous occupation. On May 22, 1919, the right leg showed a moderate degree of knock knee, considerable relaxation of the knee joint, and a slight permanent flexion of about five degrees. The leg can be

Fig. 10. Case 7. Note comminuted fracture of head of tibia with fracture of internal spine of tibia, and a loose fragment.

Fig. 11. Case 8. Note transverse fracture through head of tibia and fracture at base of spines of tibia; note dropping of external articular surface of tibia.

flexed to 90 degrees and fully extended. He still had moderate knock knee and slight joint relaxation. There is no appreciable shortening. He complains of pain and weakness in the leg.

A roentgenogram which I took showed that he had had a rather unusual fracture, namely, a transverse one through the tuberosities of the tibia as well as a fracture of the internal spine of the tibia at its base, with some dropping down of the inner tuberosity, which has resulted in knock knee. He has some trouble going up and down stairs, and in getting on and off a team. (See Fig. 11.)

These cases represent a fairly severe type of injury to the knee joint. The cases followed show very good ultimate function. The treatment has been non-operative; generally long fixation in extension, followed by massage and baking, and passive and active motion.

Early manipulation to restore joint surfaces to normal planes might have been of use but was not done. No operation to restore tibial spines or repair torn crucials has been done in this series, although the operation has been done by Pringle (6) and S. Alwyn Smith (7). The operation should be reserved for those cases which do not obtain full and free extension of the knee joint, combined with pain and disability. The usual method of approach is the one advocated by Sir Robert Jones, of a vertical incision through the patella, which gives one a good view of the anterior crucial ligament and spine of the tibia. By this procedure any bony mass may be removed and the leg extended.

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TUMORS OF THE TESTICLE

With Analysis of One Hundred Original Cases[1]

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FROM early historical times to the present day, diseases of the testicle have received an undue amount of attention in medical literature. The exposed position of these organs, the ease with which they may be investigated by surgical operation, and the early manifestations which any enlargements present, all tend to bring prominently to the attention of physicians definite data for diagnosis and treatment of the various pathological conditions which may involve these organs.

In respect to the inflammatory enlargements, our knowledge is fairly definite, means of diagnosis clearly determined, and methods of treatment placed on a rational and well standardized basis. Neoplasms of the testis, however, present an altogether different picture. Not only is their diagnosis difficult and made unreasonably late in the disease, but also the procedures in regard to treatment are still followed oftentimes with a blind disregard of a knowledge of the fundamental pathology and mode of extension of these tumors. Even pathologists, in all the years past in which these new-growths have been studied and classified, are by no means agreed as to their ontology, classification, or proper interpretation.

The result of this confusion is that, as a rule, the patient's welfare is being jeopardized while the surgeon, for the time being, is content with simple orchidectomy and the pathologist with some sort of a diagnosis of a malignant tumor of the testicle.

Malignant disease of any organ or tissue of the body always presents so varied a group of growth processes that strict classification and clear-cut prognosis is often difficult or impossible.

In tumors of the testicle not only are found the usual grounds for variability, but in addition we are dealing with a gland the function of which is peculiarly adapted to the production of germ cells. Thus the theoretical classification of tumors of these organs embodies the widest possible range of new pathological formations. Strangely enough that other cell gland, the ovary, whose function is often given a place analogous to that of the testicle, does not present in any closely comparable degree similar problems in tumor ontogenesis.

In general it may be confidently affirmed that tumors of the ovary are more often benign and, even when malignant, of a lesser degree of malignancy than tumors of the testicle.

With these points in mind, it was thought that the collecting and reviewing of a considerable number of these tumors,[2] together with their follow-up histories, might help in settling some of the problems of this important subject. Approximately 50 cases were obtained at the Mayo clinic, 30 cases from the various hospitals in Minnesota and 20 cases from Chicago hospitals. In other words, 100 tumors were examined. Each tumor was first carefully examined grossly and then sectioned so that numerous microscopic sections could be obtained from various areas. In this way all portions of the tumor were examined. Follow-up letters were written to all patients or their relatives when possible, and questions asked as to recurrence following operation, subsequent treatment, present state of health, time of death, etc.

The embryology and anatomy of the testicle is omitted from this abstract, also the history and résumé of the literature.

It should be borne in mind that the primary lymph nodes draining the testes are those members of the lumbar group in front of and by the sides of the aorta and vena cava below the level of the renal veins.

Tumors of the testicle have been very difficult to classify. Confusion has existed in the

[2] The author personally examined as to gross and microscopic study, follow-up letters, etc., all the tumors included from the Mayo clinic and University hospital in Minneapolis. The surgery was done by various surgeons at these institutions.

[1] Abstract of thesis submitted to the Faculty of the University of Minnesota Graduate Medical School, in partial fulfillment of requirements for the degree of Master of Science in Surgery. Reprint of the complete article including case reports may be obtained from the author on request.

classification of those tumors since the earliest findings were recorded. As an example of this is the following classification taken from an extensive article on this subject:

1. Myxosarcoma,
2. Cystosarcoma,
3. Carcinoma,
4. Mixed tumor,
5. Sarcoma,
6. Medullary carcinoma,
7. Cystoma,
8. Cystoid disease,
9. Teratoma with malignant degeneration,
10. Dermoids.

Recently Maitland, Hertzler, and others have concurred with Ewing in the belief that all of these tumors are really teratomata and that the so-called pure tumors merely represent a one-sided development of a heterogeneous growth.

Of the 101 tumors studied in this series, 97 were malignant and 4 were benign (dermoids). Thirty-five were of the mixed or embryoid type, while 62 were of the soft, cellular, medullary type. This latter type of tumor develops in the interior of the organ. The tunica albuginea is uniformly distended by a solid homogeneous tumor without cysts. The color is rose yellow and the consistency is somewhat more firm than that of normal testicular tissue. On cut sections are often seen degenerated zones, whitish in color, soft, and with the appearance of tuberculosis. Areas of hæmorrhage are frequent. On the other hand, before opening the tunica vaginalis this type of tumor looks like an enlarged testicle. The microscopic picture of this type of tumor is quite characteristic. It is made up of large, round, and polyhedral cells possessing voluminous nuclei and a much reduced protoplasm.

The next most common variety, the so-called mixed or embryoid type contains divers tissues—cartilage, muscle, epithelium with or without cyst formation, nerve tissue and sometimes bone. Cartilaginous tissue is an element very common in this tumor. Out of 35 tumors, cartilage was found in 17 of this series.

Formerly sarcoma of the testicle was the diagnosis usually made, in fact, nearly every testicular tumor was called sarcoma by the surgeon. It is really a very rare tumor if it exists at all. The typical testicular dermoid is composed of a cyst containing hair and sebaceous material, often teeth, and is lined by epidermis. This type of tumor is very rare. In all the pathological museums attached to the medical schools of London, there are only three specimens of testicular dermoids containing hair. The series reported in this paper contains four.

A further variety of tumor which is still much debated is that of the so-called chorio-epithelioma of the testis. Although such tumor undoubtedly exists, none was found in this series.

In the following suggested classification the two types which are italicized are the only ones of clinical importance, while the others are included merely to give a place to those rare tumors which undoubtedly do occur.

A. Malignant:
   1. "*Carcinomatous*"—large cell, large nucleus type undoubtedly closely related to
   2. "*Mixed tumor type*"
      a. Tumors containing cartilage, cysts, glands, etc.,
      b. Ordinary glandular structure tumors,
      c. Chorio-epithelioma,

B. Benign:
   1. "Dermoid."
   2. "Epithelial."
      a. Adenoma of the seminal tubules as described by Pock and Chevassu.
   3. "Mesoblastic."
      a. Interstitial cell tumors,
      b. Fibroma,
      c. Lipoma, myxoma

ETIOLOGY

New-growth of the testicle is a very rare disease. Approximately 600 cases have been reported. The disease occurs about once in 2000 male hospital admissions. Out of approximately 300,000 admissions to the Mayo clinics, including both males and females, about 50 cases were found. In the London hospital, records for a period of 20 years re-

ferred to 65 cases of this disease. During this time 110,000 male patients had been admitted to this hospital.

LOCATION

New-growths of the testicle are practically always unilateral. The bilateral malignant growths recorded in the literature are extremely rare and always secondary to tumor elsewhere.

HEREDITY

Heredity seems to be of little if any importance in this disease.

TRAUMA

Injury has often been named as an etiological factor. In this series 22 patients out of 100 gave a definite history of injury to the testicle.

AGE

In this series the ages were found as follows:

Less than 5 years	1
Between 6 and 17 years	0
Between 18 and 29 years	42
Between 30 and 39 years	32
Between 40 and 49 years	12
Between 50 and 75 years	12

These figures confirm the general opinion that practically all cases occur during the period of greatest sexual activity.

RELATIONSHIP TO UNDESCENDED TESTICLE

There is a prevalent idea among surgeons in general that a testis retained within the abdominal cavity is very prone to become malignant and should be removed. After an exhaustive review of the literature, together with a study of my own series, it seems logical to conclude that the abdominally situated testicle is relatively immune to malignant changes, whereas the testicle lying in the inguinal canal is more apt to become malignant than that in the scrotum.

DIAGNOSIS AND SYMPTOMS

Usually the patient consults a doctor on account of a swelling in one side of the scrotum. Nearly always this swelling has been noticed for several months and has gradually increased in size. These tumors are sometimes entirely without pain, sometimes sensitive, and occasionally very painful. In this series there was a definite history of pain in the testicle during some period of the disease in 52 cases, or 52 per cent. The tumors are particularly heavy and of firm consistency. In most cases the cord is much larger than that of the opposite side, due to the necessity of a greater blood supply to the part. But this is also true in syphilitic testicle and hæmatocele. The scrotum contains an ovoid tumor the size of a hen's egg or larger, which is smooth or slightly furrowed and firm, elastic in consistency, and does not transmit light. It is necessary to bear in mind that hydrocele often accompanies malignancy of the testicle. A great many patients come to the surgeon with the history that the family physician has repeatedly aspirated the scrotal sac for hydrocele.

Four diagnoses must be considered: neoplasm, syphilis, hæmatocele, and tuberculosis. In tuberculosis one is usually aided by the family or personal history. The growth usually increases in size quite rapidly, usually causes pain and sometimes fever. The growth first appears in the epididymis and extends along the vas as small nodules. Later on the testicle is involved and often sinuses break through the skin surface. Tuberculosis is usually only one manifestation of a generalized genital tuberculosis. The prostate and seminal vesicles may show signs of involvement and tubercule bacilli may be found in the urine.

Hæmatocele is relatively easy to distinguish. But it cannot be distinguished by its form, consistency, sensibility, or state of the cord. Two main signs are useful in differential diagnosis: (1) the palpation of the tunica vaginalis and (2) especially the palpation of the epididymis. If, on the surface of a scrotal tumor, one palpates the tunica vaginalis, it is certain that he is not dealing with an hæmatocele. It is also impossible in hæmatocele to feel the epididymis between the fingers, because one finds it hidden in the cavity of the hæmatocele. Exploratory puncture should not be done in such cases. Frequently a neoplasm is aspirated, blood is obtained, and a diagnosis of hæmatocele made. In this way harm is done in that proper treatment is delayed by the faulty diagnosis

and the more early spreading of the neoplasm becomes possible. A biopsy is warranted in all cases of doubt.

PROGNOSIS

Few neoplasms have a worse prognosis than those of the testicle. Out of 600 cases collected from the literature and which were operated upon, 465 were followed. Of these, 377, or 81 per cent, were dead, while only 25, or 5½ per cent, were found to be living and well 4 years or more after operation.

In regard to prognosis these tumors may be divided into three classes: (1) very malignant (mixed tumor type); (2) malignant—to a lesser degree (carcinomatous type); (3) truly benign or reserved prognosis (dermoids, etc.).

The mixed tumor types are generally very malignant and change rapidly in structure. This is contrary to the behavior of mixed tumors found in the parotid, submaxillary glands, and elsewhere. Of the 22 mixed tumors reported in this series only 2 patients were alive 3 years or more after operation, and 19 (91 per cent) were dead. It is a rather curious fact that out of 10 cases in this series containing cartilage all died but 1 and all cases containing papillary and squamous epithelial nests died.

The carcinomatous type of tumor is a malignant growth but of a lesser degree than the mixed type. Its evolution is slow and it remains limited for a considerable length of time. This is the kind which may be eradicated if treated early. Out of 39 cases of this variety in this series, which could be followed to death or shown to be alive 4 years or more after operation, 23 were dead and 16 were living. This gives a morbidity of 60 per cent. The prognosis is also better in the small tumors in which the cord and epididymis are uninvolved.

The prognosis in the abdominal type of tumor is especially bad, for the majority of patients do not present themselves for treatment until fairly late in the disease, owing to the fact that no symptoms may be noticeable until complications from pressure arise.

The dermoids are benign as a rule but this benignity has two reservations: (1) all such tumors are subject to malignant change and (2) it is impossible to draw a line between a relatively simple dermoid and a particularly complex mixed tumor.

TREATMENT

Simple castration has been the method of treating such cases for many years but it has been disappointing from the curative standpoint. This, of course, does not apply to the benign types some of which may be treated by simple removal of the growth and the preservation of the testicular tissue and the others by simple castration. Gross, in his statistics of 26 malignant tumors of the testicle, cites three cases of "cures,"—2 for 2 years and 1 for 14 years. Out of the 101 cases reported in this paper, 34 were of the so-called mixed type. Out of 25 of these cases which could be traced only 6 were found to be living and well, as follows:

6 months after operation	3
8 months after operation	1
7½ years after operation	1
9 years after operation	1

Only 2 cases are known to be alive 4 years after operation and only 1 of these has lived 9 years. None has reached the 10-year limit. Of the 19 patients who died, the following table shows the time after castration:

7 days to 2 months	2
2 months to 6 months	2
6 months to 1 year	6
1 year to 2 years	3
2 years to 3 years	3
3 years to 4 years	1
4 years or over	2

There were 62 cases of the carcinomatous type of tumor. Fifty-four of these cases were traced and 23 were found to be dead, following castration. The following table shows the time after castration:

7 days to 2 months	1
2 months to 6 months	6
6 months to 1 year	4
1 year to 2 years	4
2 years to 3 years	3
3 years to 4 years	3
4 years or over	2

The 31 living patients were as follows:

6 months to 1 year postoperative	3
1 year to 2 years postoperative	4
2 years to 3 years postoperative	4
3 years to 4 years postoperative	5
4 years postoperative	6
6 years postoperative	2

7 years postoperative	1
8 years postoperative	1
9 years postoperative	2
11 years postoperative	1
14 years postoperative	1
15 years postoperative	1

Hence it is seen that 15 patients are alive 4 years or more after operation, and 3 are alive 10 years after operation.

Since the advent of Coley's serum, it has been used following castration in a considerable number of cases. In 1915, Coley reported a series of 52 cases treated in this manner and contends that a better prognosis is offered by such treatment than by the radical operation. Of these 52 cases, only 2 showed involvement of the lumbar lymph nodes clinically at the time of operation. Of the remaining 50, 18 are dead, 14 have been lost from observation, and 18 are living. Of these 18 who are living, 9 have well marked metastases, and will, in all probability, die; 3 are alive over 4 years since castration; 3 are alive over 3 years; 1 over 2 years; and 2 over 1 year.

Excluding the 2 inoperable cases and the 14 which were not followed, the remaining 36 show a certain mortality of over 80 per cent while none of the remaining 20 per cent has lived long enough to be pronounced cured. In my series, only 6 patients were treated by this method. Of these, 4 (66 per cent) are dead and 2 (33 per cent) are still living, 7 and 9 years after operation. However, these 2 were both the so-called carcinomatous type of tumor and about 33 per cent of them are cured by simple castration alone.

In this series 11 patients received X-ray or radium treatments following castration. X-rays alone were used in 7 cases, X-ray and radium in 3 cases, and radium alone in 1 case. The results in the 7 cases treated by X-ray are given in the following table:

1 living and well 4 years after operation.
1 living and well 3 years after operation.
1 living and well 2½ years after operation.
1 died 3 months after operation.
2 died 7 months after operation.

Cases treated by X-ray and radium:

1 living and well 1 year after operation.
1 died 3 months after operation.
1 died 7 months after operation.

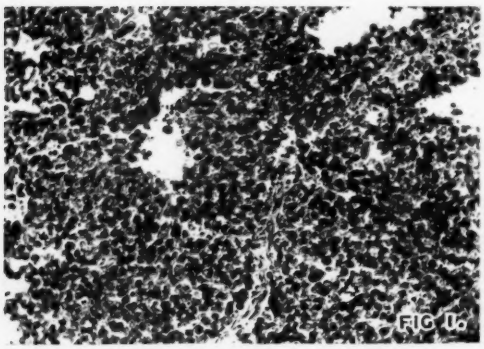
Cases treated by radium:

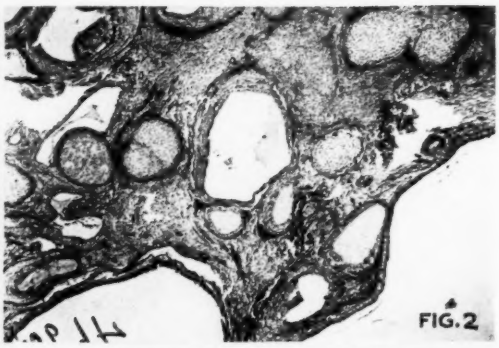
1 living and well 6 months after operation.

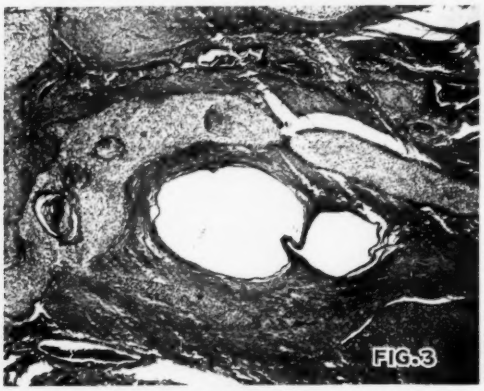
From these statistics it is seen that 5 out of 11 patients are dead and out of the 6 who are still alive only 1 patient is living over 4 years. Theoretically, the ideal treatment of malignant testicular tumors should consist in the ablation of the neoplastic organ, the lymphatics and all the nodes into which these lymphatics drain. Any given malignant tumor should be investigated as to its extension upward and in particular the state of the lumbo-aortic nodes. This is very difficult to determine. If a mass can be palpated deep in the abdomen below the umbilicus, the diagnosis is easy. But very frequently cases which are seen apparently early, and which show practically no involvement of the cord, except a slight thickening, are treated by castration and in a few months marked metastases in the lumbo-aortic nodes are seen. It is, therefore, fair to conclude that in every case of cancer of the testicle one should regard the lumbo-aortic nodes with suspicion. Complete castration should be followed by a systematic removal of the nodes draining this region.

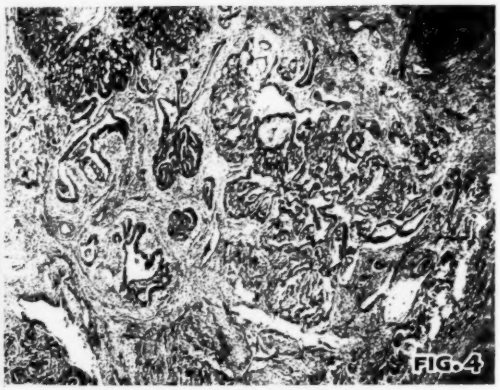
The first operation of such character was performed by Roberts, of Philadelphia, in 1902. He operated upon a patient with recurrent malignancy of the testicle by a median abdominal incision and removed the lumbar nodes. The patient died of peritonitis 2 months later. The first successful operation of this kind was performed by Cuneo in 1906. He removed four enlarged lymph nodes, one of which showed malignant invasion, and the patient remained well and free from metastases for more than 3 years, at which time he disappeared from observation. Since that time numerous surgeons, especially in France, have adopted this operation.

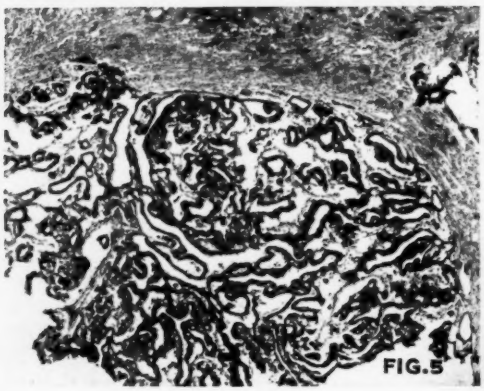
Bland-Sutton says: "Tradition plays an unconscious part in the acts of the most unconventional surgeon. This is the only explanation I can offer concerning the universal practice among surgeons when performing the ancient operation of castration for malignancy of the testicle in allowing their efforts to be limited by the internal abdominal ring. It is undeniable that the modern method of extirpating the primary growth, the associated lymphatics and the











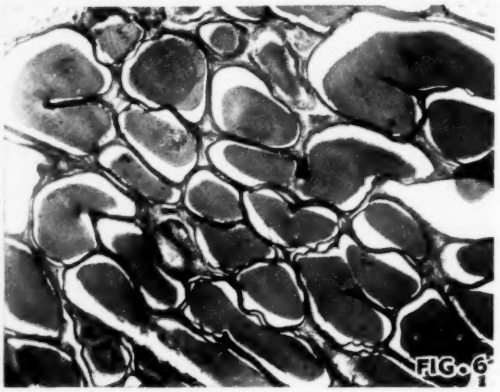


Fig. 1. Case 9. Typical large polyhedral shaped cells with deeply staining nuclei and pale cytoplasm, characteristic of the carcinomatous type tumor.

Fig. 2. Case 1. Cystic spaces and areas of cartilage in mixed type tumor.

Fig. 3. Case 12. Cystic spaces and nests of squamous epithelium containing pearl formations, found in mixed type tumor.

Fig. 4. Case 63. Peculiar gland-like structures.

Fig. 5. Case 65. Still another type of gland-like formation in mixed type tumor.

Fig. 6. Case 80. Low-power photomicrograph showing thyroid-like tissue. Other areas in same tumor also showed carcinomatous-like cells and still other areas showed gland-like structures.

lymph glands, in dealing with cancerous organs has greatly improved the remote results of operation designed for the relief of cancer. This is manifest in the case of the breasts, lips and labia."

Hinman has collected a total of 46 cases which were treated by the radical method. There was a combined surgical mortality in all cases of 11 per cent (3 deaths from pneumonia and 2 from peritonitis). Commenting on this mortality Beer says: "Even though at present the mortality of this operation is much higher than that of simple castration, experience has shown that such is the case with all new operations. The writer feels confident that during the next decade the mortality of this extensive operation will be markedly reduced."

Although sufficient time has not yet elapsed to enable us to estimate the ultimate results in all the cases treated by this method, Hinman found that 46 per cent were alive: one for 5 years, 1 for 4 years, 5 for almost 3 years, 2 for over 2 years, and 11 for 1 year or less. There is a probable cure in at least 4 cases which had lumbar nodes invaded with cancer at the time of the operation. Simple castration would not have cured any of these cases and their cure is directly attributable to the early and clean removal of the affected lymph node area.

Within the last 2 years Hinman has personally operated upon 6 cases of testicular tumor by the radical method without a single operative mortality. In 4 of these cases retroperitoneal lymph nodes containing metastatic tumor masses were removed. All 6 cases enjoy good health now 9 months, 7½ months, 4 months, 3 months, 2 months, and 3½ years, respectively, following operation. Naturally the ultimate result in these cases cannot be known for years. However, the finding of metastatic tumor tissue in the lymph nodes in 4 cases shows the futility of simple castration. A cure by the radical operation in any one of these 4 cases will have been due to the early and clean removal of the lymph draining area.

Technique of the operation. A simple castration is first performed through a high inguinal incision. The cord is dissected out as high up as possible and divided upon a clamp, preferably with a cautery. The clamp is left in place for traction on the spermatic vessels in the second part of the operation. At this stage the tumor is examined, and if found to be malignant on gross or microscopic examination, the second step of the operation is carried out. The incision is prolonged from the high inguinal incision made over the external ring to a point half an inch above the anterior superior spine. It then curves upward until it reaches the costal margin at the level of the tenth rib. The incision is carried through the muscle of the abdominal wall until the peritoneum is reached. The cord is traced until it passes through the internal abdominal ring and then with the sides of the incision strongly retracted, tension is applied to the cord in order to keep it recognizable. The peritoneum can then be stripped back by gauze dissection without carrying the cord with it. The cord is then traced well down into the true pelvis where it is divided between two ligatures.

The next procedure consists in the dissection of the fascia over a portion of the iliacus and psoas muscles, together with the spermatic vessels and lymphatics which it contains, and the removal of the nodes from off the inferior vena cava and aorta. Due to the fact that the spermatic vessels spread out above the point where the vas was ligated, it is necessary to make a wide dissection of the fascia on the outer side, and this should extend to the lateral border of the psoas muscle. On the inner side the line of division of the fascia should pass medially, crossing the common iliac at its bifurcation; here the ureter will be found and should be well exposed. The dissection is then carried upward along the inner side of the common iliac vessels to the aortic bifurcation. When the right testicle is the one involved the inner border is continued over the middle of the aorta; when the left testicle is the seat of the tumor the inner border is carried up along the right border of the aorta, where the inferior mesenteric artery must be carefully guarded. In either case the upper limit is the upper border of the renal veins. Everything between these boundaries must

be removed. The spermatic artery can be clamped as it emerges from the aorta and the vein as it enters the renal vein or inferior vena cava. After securing all bleeding points the peritoneum is allowed to fall back into place and the wound closed with drainage. This is best accomplished by a rubber tube put down to the aortic bifurcation and brought out as in kidney drainage. Hinman advises in those cases with apparent metastases the placing of a small rubber tube or catheter in the end of which is fastened a 50 milligram tube of radium alongside of the rubber drainage tube. In this way metastatic areas could be radiated from above downward by moving the catheter certain distances at intervals of one to two hours.

The radical operation should never be undertaken when abdominal metastases are recognizable clinically and should be used only in those cases in which the disease is apparently limited. Owing to the deep position of the nodes these cases cannot always be differentiated before operation, so that every case in which there is clinically no invasion is suitable for this operation. Before proceeding with the operation, the diagnosis should be confirmed by examination of the tumor following the first stage of the operation, castration. This would prevent further operation in cases of syphilitic testicles in which an incorrect diagnosis had been made. The non-operative treatment consists of Coley's serum, radium or X-ray treatments, and should be used in all cases which show abdominal metastases clinically.

SUMMARY

1. New-growth of the testicle occurs about once in 2000 male hospital admissions.

2. The disease is practically always unilateral—involving both sides only as a metastatic growth from the skin, seminal vesicles, etc.

3. Trauma as an etiological factor in these tumors evidently has some foundation.

4. Practically all cases occur between the ages of 18 and 50 years, the period of greatest sexual activity.

5. Both testicles are involved with about equal frequency.

6. Undescended testicles within the canal are more apt to become malignant than normally placed organs. Undescended testicles within the abdomen are relatively immune to malignant changes.

7. The average mortality of these tumors taken from the literature is about 80 per cent, based on a 4 year postoperative period.

8. In this series the mortality was found to be about 70 per cent.

9. The so-called mixed type of tumor gives a much higher mortality than the carcinomatous type. In this series it was 90 per cent in the former type and 60 per cent in the latter.

10. Tumors containing cartilage and squamous epithelium seem to have a decidedly unfavorable prognosis.

11. The prognosis in abdominal tumors is also very bad—only 6 per cent of a large series being alive and well 2 years after operation.

12. The radical operation should be performed in all cases in which the disease is apparently limited, i.e., in cases showing no abdominal metastases clinically.

13. The ordinary castration operation, even when supplemented by Coley's serum, X-rays or radium, does not yield satisfactory results.

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OVARIAN TRANSPLANTATION[1]

I. Brief Abstract of Articles Published in 1917 to 1921 Inclusive. II. Summary of Abstracts Arranged by Subjects. III. Author's Conclusions. IV. Exhaustive Bibliography

By FRANKLIN H. MARTIN, M.D., F.A.C.S., Chicago

I. Brief Abstract of Articles Published in 1917 to 1921 Inclusive

In a paper on the transplantation and retention of ovarian tissue after hysterectomy, Graves (52) has come to the conclusion that the retention of ovaries after hysterectomy insures only a slight improvement in the menopause symptoms over ablation, and this slight advantage, if it exists at all, does not compensate for the dangers of adhesions with cyst formation, malignant degeneration, and physiological disturbances which the conservation of the ovaries entails. Transplantation made within the leaves of the broad ligament in the paracervical cellular tissue proved unsatisfactory in the first case because the transplanted tissue became cystic and painful.

Transplantations made in the abdominal rectus muscle are of doubtful value, according to results tabulated by the author, more trouble being reported by the patients than in cases of total ablation. Making allowances for limited observations and variations in patients' reports, "the conclusion is inevitable that when the uterus has been extirpated, transplanted ovarian tissue probably *has no marked influence one way or the other* on the surgical menopause symptoms." Tuffier is of the same opinion. Chalfant also reaches similar conclusions, except that in some 17 cases recorded he did find an improvement over 40 total ablation cases. The experience of the author, of Tuffier, and of Chalfant supports the theory that "so-called ablation symptoms are due to a breaking of the utero-ovarian harmony, and that if the uterus is removed the retention of ovarian tissue *in situ* or by transplantation is of little physiological value."

If the *uterus is not removed*, the utero-ovarian harmony may be retained for a time at least by transplanted ovarian tissue, so that menstruation may continue and ablation symptoms be prevented. However, the author questions the advisability of leaving the uterus by itself in the pelvis, with the ovaries transplanted to some distant part. His experience leads definitely to the conclusion that when both ovaries are removed, the uterus also should be extirpated, for an isolated uterus almost invariably causes trouble and frequently requires removal. Implantation of the ovaries "does not in any way obviate this difficulty."

It is possible to restore utero-ovarian harmony by heteroplastic transplantation in castrated women in whom the uterus has been left *in situ*, so that menstruation is resumed and ablation symptoms made to disappear. Such operations are not universally successful, as heteroplastic grafts do not always take into account the physiological antagonism of blood and tissue that exists between different individuals. Where castration with extirpation of the uterus is followed by historic menopause symptoms of the severest type, heterotransplantation may be useful in some instances.

After having tried the various sites for ovarian transplantation, Mauclaire (94) has come to the conclusion that the best results follow the intra-epiploic graft which is most rapidly vascularized. In a series of ten intra-epiploic autografts, eight cases were followed and menstruation had occurred in all. Out of five cases of intra-epiploic homografts, two had been followed and the results seemed permanent. The question of inheritance in the case of the homograft is still an open one, as is also the question as to whether blood from the donor should be injected into the recipient as a preliminary to the operation. The success of the intra-epiploic heterograft is yet to be tested.

[1] Read before the American Gynecological Society, Washington, May 1-3, 1922.

Schickele (131) reports a case in which a human ovary was grafted to either side of the broad ligament in a patient who had had no ovaries. A year later the vagina, which had been very narrow, had grown somewhat. In 3 years, both uterus and vagina had increased considerably in size, so that cohabitation could occur without pain. At intervals of from 7 to 8 weeks the breasts swelled, and a bloodless excretion emanated from the vagina. Conditions remained unchanged up to the time of writing, 5 years after operation.

There are, according to Unterberger (142), only two indications for transplantation of the ovary: bilateral benign ovarian tumors, in cases where resection is not practicable; severe chronic affections of the adnexa (especially pyosalpingitis with adhesions about the ovaries) which resist conservative treatment.

Both ovaries, affected with benign tumor, were removed by the writer from a young patient. Under microscopic examination, some normal tissue was discovered. Disks of this tissue were implanted in abdominal walls between the rectus muscle and the sheath. After a 3 months' menopause, menstruation occurred with comparative regularity. It was preceded each time by a slight swelling of the transplanted elements.

The writer has employed the same method in severe cases of inflammation of the adnexa and in cases of pyosalpingitis in which continued conservative treatment had been of little avail. Although conservative treatment is generally favored in pyosalpingitis, operation is frequently necessary. The results were in no case very favorable. When the diseased adnexa were removed on both sides, abrupt cessation of menstruation occurred. The patients were usually young. When an adhering ovary was preserved *in situ*, new adhesions appeared between the ovary and its surroundings. In these cases the writer took portions of the sterile ovary and transplanted them to the abdominal walls. This simplified the healing of the wound in the abdominal cavity and preserved menstruation without giving rise to new adhesions.

This operation was performed on nineteen women. Only those cases were considered in which it was possible to remove completely all ovarian tissue from the abdomen. Menstruation appeared from 2 to 7 months after the operation, the period coinciding in each case with the interval required for the healing of the transplanted tissue. In a woman in the forties, however, the return of menstruation was rapidly followed by complete menopause. In the younger women, menstruation could usually be prolonged for 5 years. It was found that the climacteric appears earlier in these cases than in the normal, but that the menopause occurs more normally than in cases of operative castration.

Homoplastic transplantation has been less successful in therapeutic cases than in experimental investigations, possibly owing to the fact that in the case of animals, normal ovaries are employed, while with human beings a pathological organ is always involved. We have not yet determined, moreover, to what extent the diseased condition is influenced by the internal secretions of other glands. The conditions for transplantation offer still more contrast in cases where the ovaries have been removed for a considerable length of time. In the latter case, homoplastic transplantations are worthless.

In a more extensive contribution to the subject, Unterberger (143) draws the following conclusions:

A. *Autoplastic operations* (transplantation of the patient's own ovaries).

(1) The ovaries can be very reliably grafted by autoplastic procedures in the human female; (2) fragmentary transplantation furnishes better results than transplantation of the whole ovary; (3) as the site of transplantation, in laparotomy cases, the anterior abdominal wall, between the rectus and the anterior sheath of the rectus, is recommended; (4) even up to the end of 5 years after autoplastic transplantation, regular menstrual periods are observed; (5) autoplastic grafting is indicated: (a) in the presence of benign bilateral ovarian tumors; (b) in grave bilateral disease or suppuration of the adnexa.

B. *Homoplastic operations* (transplantation of ovaries from other women).

(1) The results are very unreliable; (2) in women who have been castrated a long time ago, or who have arrived at the menopause, ovarian transplantations are always unsuccessful; (3) homoplastic operations are indicated only in the presence of atrophy or infantilism of the genitals, with preservation of the ovaries of the recipient.

C. *Heteroplastic operations* (transplantation of non-human ovaries).

(1) The ovaries of certain species of macacus apes enter into consideration; (2) the indication for the performance of the grafting is the same as in homoplastic transplantation.

In Cramer's (34) experience extraperitoneal transplantation has proved more successful than intraperitoneal, especially when the graft is placed in the cavity of Retzius or within the rectus muscle. In some instances, thin disks taken from the ovarian surface after removal of the stroma were sutured to the muscle. The results were most satisfactory when a large amount of corpus luteum was included. Ninety-five autoplastic operations were divided into the following groups: (1) reimplantation of one ovary, with preservation of the other *in situ* (32 cases); (2) reimplantation following removal of both ovaries, with preservation of the uterus (26 cases); among nineteen cases examined menstruation was preserved in eighteen; (3) reimplantation with removal of the uterus and both adnexa (37 cases). Menopause symptoms were absent in thirty of the latter group. In seven homoplastic cases, menses were re-established in three cases, severe menopausal symptoms disappeared in two cases, while in two cases of castration results were negative in consequence of anaphylaxis.

De Rouville and Cohen (121) have reported two cases which seem to prove quite definitely that the re-establishment of menstruation after autotransplantation is dependent upon the grafted ovary and not upon ovarian fragments left behind at the time of the oophorectomy. In the first case, a woman 23 years of age, in which the patient's own ovaries were transplanted under the lips of the laparotomy incision, the patient suffered from menorrhagia, metrorrhagia, and swelling and tenderness of the grafts at periodic intervals 18 months after the operation. Menstruation and all untoward symptoms ceased following removal of the grafts. Microscopic examination demonstrated not only the persistent vitality of the grafts, but certain incipient degenerative changes in the corpora lutea which probably accounted for the disturbed endocrine balance.

In the second case, both ovaries were removed from a woman 32 years of age and a portion of the right ovary grafted in the subcutaneous tissues of the right side. Menstruation was re-established 3 months after the operation and remained regular for 6 months, at which time severe pain in the left iliac fossa called for a second operation. A subtotal hysterectomy was performed, and the uterus was found to be undergoing sclerotic changes which probably coincided with the disappearance of the trophic function of the grafted ovary.

As a result of careful microscopical studies of ovarian transplantation in guinea pigs, Athias (10) has found that in the graft sections the epithelial layer usually shows invaginations, that the epithelial cells increase in size and take on a globular form with nuclei containing mitotic and karyokinetic figures 3 to 8 days after operation, and that among these epithelial cells are certain elements which in form, size, and structure closely resemble oocytes. The author has not yet traced a complete cycle of nuclear transformation, but he feels justified in concluding that in ovarian transplantation, an ovular neoformation can be produced at the cost of invagination of the superficial epithelium.

By careful study of sections of transplanted ovaries, Long and Evans (75) have demonstrated that the grafts contain healthy and atretic follicles, corpora lutea of several ages, and interstitial tissue. While there was no actual evidence of true ovulation, there was, nevertheless, an apparent rhythmic production of corpora lutea from unbroken follicles, as is known to occur rarely in normal animals. In another series of experiments by the authors (76) the transplantation of adult ovaries into young animals resulted in a sudden maturity of the gland.

Bell (17) has recently recorded his experience in a series of ninety-eight cases of ovarian transplantation as follows:

1. Total number of cases recorded, 98. Indication for operation.

A. Salpingo-oophoritis	
Primary lesion	84
Associated appendicitis	4
With fibromyomata uteri	5

B. Innocent neoplasms, bilateral or of remaining ovary 4
C. Ovarian pain with functionless uterus. 1
2. Total number of cases excluded, 31.
A. Operations within 6 months 10
B. Death after operation 1
C. Failure to obtain after-histories 20
3. Total number of cases analyzed, 67.
A. Number of cases in which menstruation was possible 57
a. Number of cases in which menstruation occurred 38
b. Number of cases which did not menstruate and in which there was no menopausal symptom ... 9
c. Number of cases which did not menstruate and in which there were menopausal symptoms 10
B. Number of cases in which subsequent menstruation was possible owing to supravaginal or complete hysterectomy having been performed 10
a. Number of cases in which menopausal symptoms did not occur .. 7
b. Number of cases in which menopausal symptoms occurred 3
C. a. Number of cases in which functional results were obtained 54
b. Number of cases in which there was failure to obtain functional results 13

The author notes that in two cases there was painful swelling of the graft associated with rather profuse menstruation; in another case a small graafian follicle retention-cyst caused continuous uterine hæmorrhage; the cyst was excised from the rectus muscle under local anæsthesia. In the cases in which menstruation returned, menopausal phenomena persisted until the secretion from the implanted ovarian tissue was available. In only a few cases did menstruation become regular. The chief indication for the procedure, according to the author, is a serious pelvic infection, particularly that due to the gonococcus, which has rendered further conception impossible. The operation is contraindicated in women over 42, in women sexually inactive, and in all cases in which conservation is possible. The important points in Bell's technique are as follows:

(1) All grafts in the human subject must be autoplastic; (2) After the ovaries have been removed the ovarian tissue from which the graft is cut should be dropped to the bottom of the pouch of Douglas, where it will be kept warm and moist until the end of the operation when it is required for grafting; (3) When possible, healthy ovarian tissue, which may include all the elements of the organ, should be used. This should be criss-crossed with a sharp knife into adherent fragments, after the dense tunica albuginea has been removed in order to favor rapid vascularization of the grafted tissue; (4) The graft, provided there is no suppurative infection of the ovary, may be placed in the rectus muscle before the laparotomy wound is closed. I have also implanted the graft in the uterus or what was left of the organ. It is most important that the graft should be placed in a vascular site, yet it should not be surrounded with blood. Too much care cannot be taken in placing the graft among the muscle fibers; (5) If the ovaries are badly infected and more or less completely converted into the walls of abscess cavities, whatever tissue can be removed should be implanted in the internal oblique muscles alongside the drainage tube, which in such circumstances is passed through a stab wound well away from the central incision into the pelvis. I have, however, never seen an infected graft slough; moreover, in several such cases, menstruation has subsequently occurred.

The author concludes with emphasis on the fact that "this procedure should be looked upon as a measure of necessity, which can never be weighed in the balance against the preservation of the natural connections of the normal ovary."

As the result of a series of experimental studies following oophorectomy, Bailey (11) has come to the conclusion that a very definite interrelation exists between the uterus and the ovaries. Metabolism investigations showed a reduction both of the oxygen consumed and of the carbon dioxide eliminated after removal of the ovaries, the greatest reduction occurring 2 to 3 months after operation when atrophic changes have probably taken place in the uterus. Previous experiments by Marshall and Jolly and others have clearly demonstrated that oophorectomy is followed by fibrosis and atrophy of the uterus. Hence, it is clear that the uterus depends upon some trophic influence from the ovary for its maintenance. The influence of the uterus upon the ovaries is not so clear. The author found that experimental hysterectomy in young animals was followed by normal ovarian development, while in adult animals no change in the ovaries could be demonstrated until after a 3 or 4 month period. Clinical experience has shown that the menopause occurs after hysterectomy even though the ovaries remain. The author

is, therefore, of the opinion that "transplantation of the ovary is of no value in relieving menopausal symptoms, unless the uterus or part of it remains."

Two hundred and thirty ovarian graft operations have been performed by Tuffier (139) during the past 14½ years. The object of this procedure was:

1. To conserve or re-establish the physiological state and menstruation after removal of the ovaries and the tubes when the uterus has been preserved.

2. To try to ameliorate the symptoms due to complications following the removal of the uterus and of the ovaries.

Sixty of the transplantations were performed after total or supravaginal hysterectomy, 156 after oophorectomy with total conservation of the uterus, and four after oophorectomy and subtotal hysterectomy. Four patients of the 230, or 1.8 per cent, died from abdominal infection due to the original disease.

The seat of the autograft or homograft was subcutaneous cellular tissue (71 cases), subperitoneal cellular tissue (54 cases), and in some cases, the posterior of the mammary gland (3 cases), the site not being stated in the remainder.

The true graft (homograft) is the grafting of the ovary of one woman into another woman (20 cases). Transposition (autotransplantation) is the removal of the ovary from the abdomen and its transposition in subcutaneous or subperitoneal cellular tissue (203 cases). In six cases, both homografts and autografts were used.

A homograft never resulted in the physiological re-establishment of menstruation. Menopausal disturbances following hysterectomy and castration were never suppressed by immediate or late homografts, although the symptoms were slightly ameliorated in some cases.

The condition of the ovary used in the autograft cases was normal or sclerotic, often microcystic, situated in contact with an infected region, but itself free from the infection. The conditions necessitating castration in the cases on which this paper was based were salpingitis (141 cases), fibroma (35 cases), extra-uterine pregnancy (5 cases), cysts (22 cases), and grave disturbances of the menopause (5 cases).

The nature and the duration of the conditions for which the ovaries were removed seem to have little influence on the therapeutic result. On the other hand, the age of the patient is important, favorable results seldom occurring after the age of 40. Generally, the graft did not give rise to pain or other symptoms during the first 4 or 5 months, although slight congestive phenomena may occur at the site of the graft. In five cases these congestive phenomena were repeated and menstruation did not follow. During this period, the patient presented all the usual signs of castration. From the fifth to the seventh month, if the graft is efficacious, it increases in size periodically and becomes congested for perhaps a week prior to menstruation. The return of menstruation can be obtained only in the cases where the uterus or two-thirds of it is preserved. Extirpation of the fundus does not necessarily prevent the return of menstruation. This function returns in 5 to 7 months after the graft, rarely 10 months.

During the entire period of the operation and the re-establishment of menstruation, the patient shows all the signs of the menopause. All these disappear after the first start of the flow of blood. This menstruation is not regular as to quantity, duration, or periodicity. The site of transplant does not seem to influence the result. The transposed ovaries have a new vascularization, but undergo degenerative changes more rapidly than ovaries in their normal position.

Of seventy-three cases in which the ovary was transplanted with preservation of the uterus and in which from 4 months to 12 years have followed the operation, menstruation has been regular in fifty-six (76.71 per cent). The youngest patient was 18 and the oldest 41 years of age. The ages of the other patients ranged from 18 to 40 years. Menstruation usually returns 5 to 7 months after the transplantation; if it appears earlier, it is due, Tuffier believes, to a section of ovary left at operation.

The accompanying table gives the men-

No. of cases	Age of patient (years)	Initial disease	Date since start of malady	Appearance of menses after operation	Disappearance of menses after start	Mode of graft
113	32	Salpingitis and renal ptosis	3 years	6 months	11 months	Auto
174	34	Salpingitis	?	10 months	13 months	Auto
138	35	Salpingitis	?	7 months	14 months	Auto
165	23	Salpingitis and appendicitis	5 months	?	17 months	Auto
117	26	Suppuration and salpingitis	15 days	?	2 years, 2 months	Auto
118	23	Salpingitis	3 months	?	3 years, 6 months	Auto
136	35	Salpingitis	9 years	?	2 years, 4 months	Auto
60	29	Salpingitis	2 months	4½ months	2 years, 6½ months	Auto
96	25	Salpingitis	3 years	8 months	2 years, 8 months	Auto
130	27	Salpingitis	9 months	Reviewed after 1 year	4 years	Auto
21	36	Cystic salpingitis	1 month	Reviewed after 2 years, 3 months	3 years, 4 months	Auto
35	26	Salpingitis	2 years	Reviewed after 2 years, 6 months		Auto
46	27	Salpingitis	15 days	Reviewed after 17½ months	19 months	Auto and homograft

strual record of thirteen cases out of the 230 on which the paper is based.

Following a visit to Tuffier's clinic, G. R. White (147) with Charles Usher had the opportunity of operating on fifty-five cases which are the basis of a recent report.

The general technique of the operation used by them is to remove the ovaries and tubes, leaving the uterus. The parts not desirable for the graft are trimmed away, the ovaries opened and inserted one on each side between the rectus muscle and the peritoneum well out toward the lateral edge of the muscle. No suture is required and the abdominal wound may be closed in the usual way. Drainage of the peritoneal cavity may or may not be employed and sepsis, if not excessive, does not interfere with the grafts.

The indications for the operation vary. If the case is one in which the pathological condition can be corrected or removed, a conservative operation should be performed. and the ovarian graft has no substitute. In cases where pregnancy is impossible and the ovaries, if left behind, would be a menace to the health of the patient, Tuffier's graft offers a method whereby the advantages of a radical operation may be obtained and at the same time the menstrual function preserved.

Three of the author's cases were for nervous conditions associated with menstruation. One, a case of true epilepsy with severe attacks at the menstrual period, was improved by the operation. A case of hystero-epilepsy with normal genitalia was not improved. The third case was that of infantile uterus with dysmenorrhœa and hystero-epilepsy. There was no hysterical attack at the time of writing, which was one year after the operation. Twenty of the fifty-five cases have been followed to date. In all but one case menstruation was re-established, beginning in from one to 6 months after the operation. In two cases menstruation ceased and the menopause came on within a year. In the majority of cases, menstruation became regular and ceased between the second and third year. In two cases it ceased after 5 years, and in one case, 6 years intervening since the operation, it still continues. About half of the patients complain of excessive menstruation the first few months after re-establishment of the function. When menstruation ceased, nearly all patients had flushes and the usual symptoms of the menopause, but in no case were they excessive. There has been no case of marked obesity; nearly all speak of greatly improved health.

The author summarized the results by stating that Tuffier's graft re-establishes menstruation after oophorectomy in practically every case. Menopause comes on gradually and is similar in all essentials to the normal menopause. This operation "saves the patient from much physical and psychic discomfort."

II. Summary of Abstracts Arranged by Subjects

1. Indications for transplantation

The chief indications for ovarian transplantation are: Bilateral benign ovarian tumors in cases in which resection is not practicable, and severe chronic affections of the adnexa which resist conservative treatment (Unterberger).

The chief indication for transplantation is a serious pelvic infection, particularly that due to the gonococcus. In 98 cases only five grafts were made in the absence of pelvic infection. The operation is contra-indicated in women over 42, in women sexually inactive, and in all cases in which conservation is possible. It "should be looked upon as a measure of necessity, which can never be weighed in the balance against the preservation of the natural connections of the normal ovary" (Bell).

The object of transplantation in 230 grafts performed by Tuffier was: (1) to conserve or re-establish the physiological state and menstruation after removal of the ovaries and the tubes when the uterus has been preserved; (2) to try to ameliorate the symptoms due to complications following the removal of the uterus and of the ovaries. Sixty of the transplantations were performed after total or supravaginal hysterectomy, 156 after oophorectomy with total conservation of the uterus, and four after oophorectomy and subtotal hysterectomy. Four patients of the 230, or 1.8 per cent, died from abdominal infection due to the original disease (Tuffier).

Out of fifty-five grafts, three were performed for nervous conditions associated with menstruation (White).

2. Influence of oophorectomy upon the uterus

A very definite interrelation exists between the uterus and the ovaries. Metabolic studies showed a reduction both of the oxygen consumed and of the carbon dioxide eliminated after removal of the ovaries, the greatest reduction occurring 2 to 3 months after operation when atrophic changes have probably taken place in the uterus. The uterus must, therefore, depend upon some trophic influence from the ovary for its maintenance (Bailey).

3. Transplantation with uterus *in situ*

If the uterus is not removed, ovarian transplantation may retain the utero-ovarian harmony for a time, but Graves has come to the conclusion that the uterus should be extirpated when both ovaries have been removed as an isolated uterus is likely to cause trouble which implantation of the ovaries cannot obviate.

The climacteric appears earlier than normal in cases in which the ovaries have been transplanted, but the menopause occurs more normally than in cases of operative castration (Unterberger).

4. Transplantation after hysterectomy

The experiences of Graves, Tuffier, and Chalfant indicate that the retention of ovarian tissue *in situ* or by transplantation after removal of the uterus is of little physiological value (Graves).

"Transplantation of the ovary is of no value in relieving menopausal symptoms, unless the uterus or part of it remain" (Bailey).

The return of menstruation can be obtained only in the cases where the uterus or two-thirds of it is preserved (Tuffier).

5. Sites for transplantation

Mauclaire has come to the conclusion that the best results follow the intra-epiploic graft, which is easily vascularized.

Thin disks of ovarian tissue may be implanted in the abdominal wall between the rectus muscle and its sheath (successful case reported by Unterberger).

Successful case of homograft on either side of the broad ligament has been reported by Schickele.

As the site of transplantation, in laparotomy cases, the anterior abdominal wall, between the rectus and the anterior sheath of the rectus, is recommended (Unterberger).

Extraperitoneal transplantation is more successful than intraperitoneal, especially if the graft is placed in the cavity of Retzius or

within the rectus muscle. Thin disks were sutured to muscle (Cramer).

The seat of the autograft or homograft was subcutaneous cellular tissue (71 cases), subperitoneal cellular tissue (54 cases), and in some cases, the posterior of the mammary gland (3 cases), the site not being stated in the remainder (Tuffier).

The site of the transplant does not seem to influence the result (Tuffier).

The ovaries should be opened and inserted one on each side between the rectus muscle and the peritoneum well out toward the lateral edge of the muscle (White).

Bell states that—

"a. All grafts in the human subject must be autoplastic.

"b. After the ovaries have been removed the ovarian tissue from which the graft is cut should be dropped to the bottom of the pouch of Douglas, where it will be kept warm and moist until the end of the operation when it is required for grafting.

"c. When possible, healthy ovarian tissue, which may include all the elements of the organ, should be used. This should be criss-crossed with a sharp knife into adherent fragments, after the dense tunica albuginea has been removed in order to favor rapid vascularization of the grafted tissue.

"d. The graft, provided there is no suppurative infection of the ovary, may be placed in the rectus muscle before the laparotomy wound is closed. I have also implanted the graft in the uterus or what was left of the organ. It is most important that the graft should be placed in a vascular site, yet it should not be surrounded with blood. Too much care cannot be taken in placing the graft among the muscle fibers.

"e. If the ovaries are badly infected and more or less completely converted into the walls of abscess cavities, whatever tissue can be removed should be implanted in the internal oblique muscles alongside the drainage tube, which in such circumstances is passed through a stab wound well away from the central incision into the pelvis. I have, however, never seen an infected graft slough; moreover, in several such cases, menstruation has subsequently occurred."

6. AUTOPLASTIC TRANSPLANTATION

Out of ten intra-epiploic autografts, eight cases were followed and menstruation had occurred in all (Mauclaire).

Unterberger reports successful results in nineteen cases, menstruation appearing from 2 to 7 months after the operation and being prolonged for 5 years in the younger women. The following conclusions are reached by Unterberger:

"a. The ovaries can be very reliably grafted by autoplastic procedures, in the human female.

"b. Fragmentary transplantation furnishes better results than transplantation of the whole ovary.

"c. As the site of transplantation, in laparotomy cases, the anterior abdominal wall, between the rectus and the anterior sheath of the rectus, is recommended.

"d. Even up to the end of 5 years after autoplastic transplantation, regular menstrual periods are observed.

"e. Autoplastic grafting is indicated: (a) in the presence of benign bilateral ovarian tumors; (b) in grave bilateral disease or suppuration of the adnexa."

Cramer reports ninety-five autoplastic operations as follows: (1) reimplantation of one ovary, with preservation of the other *in situ* (32 cases); (2) reimplantation following removal of both ovaries, with preservation of the uterus (26 cases); among nineteen cases examined, menstruation was preserved in eighteen; (3) reimplantation with removal of the uterus and both adnexa (37 cases). Menopause symptoms were absent in thirty of the latter group.

"All grafts in the human subject must be autoplastic" (Bell).

Out of 57 cases of autografts in which menstruation was possible, it was re-established in 38; of the remaining 19 cases, menopausal symptoms occurred in 10. Of 10 cases in which hysterectomy precluded the re-establishment of menses, menopausal symptoms occurred in 3. In the cases in which menstruation returned, menopausal phenomena persisted until the secretion from the implanted ovarian tissue was available. In only a few cases did menstruation become regular (Bell).

7. HOMOPLASTIC TRANSPLANTATION

The question of inheritance in the case of the homograft is still open, as is also the question as to whether it is advisable that blood from the donor should be injected into the recipient as a preliminary to the operation (Mauclaire).

Out of five cases of intra-epiploic homografts, two had been followed and the results seemed permanent (Mauclaire).

Schickele reports successful results in a case in which a human ovary was grafted to either side of the broad ligament.

"a. The results are very unreliable.

"b. In women who have been castrated a long time ago, or who have arrived at the menopause, ovarian transplantations are always unsuccessful.

"c. Homoplastic operations are indicated only in the presence of atrophy or infantilism of the genitals, with preservation of the ovaries of the recipient" (Unterberger).

In seven homoplastic cases, menses were re-established in three cases, severe menopausal symptoms disappeared in two cases, while in two cases of castration results were negative because of anaphylaxis (Cramer).

Homograft alone was performed by Tuffier in 20 cases. In 6 cases, homografts and autografts were combined (Tuffier).

A homograft never resulted in the physiological re-establishment of menstruation. Menopausal disturbances following hysterectomy and castration were never suppressed by immediate or late homografts, although the symptoms were slightly ameliorated in some cases (Tuffier).

8. HETEROPLASTIC TRANSPLANTATION

The utero-ovarian harmony may be restored by heteroplastic transplantation, but this operation has not been universally successful, as heteroplastic grafts do not always take into account the physiological antagonism of blood and tissue that exists between different individuals and different species (Graves).

The success of the intra-epiploic heterograft is yet to be tested (Mauclaire).

"a. The ovaries of certain species of macacus apes enter into consideration.

"b. The indication for the performance of the grafting is the same as in homoplastic transplantation" (Unterberger).

9. RESULTS FOLLOWING AUTOGRAFTS AND HOMOGRAFTS

Of 73 cases in which the ovary was transplanted with preservation of the uterus and in which from 4 months to 12 years have followed the operation, menstruation has been regular in 56 (76.71 per cent). The youngest patient was 18 and the oldest 41 years of age. The ages of the other patients ranged from 18 to 40 years. Menstruation usually returns 5 to 7 months after the transplantation; if it appears earlier, it is due to a section of ovary left at operation (Tuffier).

Twenty out of 55 cases operated upon by White have been followed to date. In all but one case menstruation was re-established, beginning in from 1 to 6 months after the operation. In two cases menstruation ceased and the menopause came on within a year. In the majority of cases, menstruation became regular and ceased between the second and third year. In two cases it ceased after 5 years, and in one case, 6 years intervening since the operation, it still continues. About half of the patients complain of excessive menstruation the first few months after re-establishment of the function. When menstruation ceased, nearly all patients had flushes and the usual symptoms of the menopause, but in no case were they excessive. There has been no case of marked obesity and nearly all speak of greatly improved health (White).

10. MICROSCOPICAL CHANGES IN OVARIAN GRAFTS

After finding invaginations of the epithelial layer and cells closely resembling oocytes, Athias has concluded that in ovarian transplantation an ovular neoformation can be produced at the cost of invagination of the superficial epithelium.

Long and Evans found no actual evidence of a true ovulation, but there was an apparent rhythmic production of corpora lutea from unbroken follicles, as corpora lutea of several ages were demonstrated in sections.

III. Author's Conclusions

This surgical subject, the scientific aspect of which is intertwined with so much that appeals to the more human imagination, is one, judging from the literature and the lack of interest manifested in it by serious minded surgeons, whose lack of progress is not overstimulating to a disinterested observer.

My first report was made in 1903; my second report in 1908; my third in 1911; my fourth in 1915; my fifth in 1917. As in this, my sixth report, I have attempted each time to bring the literature up to date, and to furnish a complete bibliography.

I can summarize my impression of the whole subject by saying that as more evidence is accumulated from the literature, the claims of the earlier enthusiasts seem to become less and less substantial.

The one most hopeful feature that I am able to glean from the mass of more or less loosely recorded evidence is that the clinical records dealing with transplantation in the human show that while autotransplants give some evidence of success, homotransplants and heterotransplants give practically none at all. On the other hand, definite evidence of success is recorded as the result of carefully conducted experiments on animals in which matters of selection of appropriate material and proper technique are more controllable than in dealing with the human. May we hope that this fact and a more careful study of the subject from a scientific and experimental standpoint will reverse the unsatisfactory showing?

In the meantime, in the light of previous publications, the opinions expressed in the writings on this subject in 1918, 1919, 1920, and 1921, may be summarized as follows:

1. Clinically, there is very little to encourage one to believe that transplantation of ovaries as practiced up to the present time has more than speculative value as a surgical procedure.

2. There is some evidence that autotransplants are of some value in deferring the symptoms of the menopause and delaying the cessation of menstruation. It is difficult, however, not to attribute some of this evidence to suggestive therapeutics or to unattached ovarian tissue left *in situ*.

3. There is practically no convincing evidence that homotransplants have been successful in the human female.

4. There is no evidence that heterotransplants have been successful where the human female has been the recipient.

5. There is some encouraging evidence recorded in experimental animal surgery that not only autotransplants, but homotransplants and even heterotransplants have been successful and the sexual function of the castrated animal maintained.

6. The technique followed by the various operators on human females, in too many instances, seems unsurgical and too often is incompletely and loosely recorded, leaving the impression that the conclusions derived from such work must be unreliable.

7. There is, however, encouraging evidence in all of this endeavor to lead one to hope that the subject will be pursued experimentally, especially for the purpose of devising a rational and simple technique, based on the work of the serologists, the endocrinologists, the hæmotologists, and the practical clinical surgeons.

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TRIPARTITE CLEFT PALATE AND DOUBLE HARELIP IN "IDENTICAL" TWINS[1]

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IN the literature of cleft palate and harelip and by personal communication, I have been unable to discover a case where "identical" twins were both afflicted with congenital tripartite cleft palate accompanied by double harelip. Truman W. Brophy (1) reported six cases of twins in which one of the twins had a cleft palate. William L. Shearer (2) reported three cases of cleft palate twins. One of these was of "identical" twins, in which both children were afflicted with clefts involving both the hard and soft palate; both were girls; one had a harelip on the right side, and the other a harelip on the left side. In another case one child was normal and the other had a single cleft palate. His third case was that of a boy and girl, one of whom had a cleft of the soft palate; the other a cleft of the hard palate and a single harelip. M. N. Federspiel (3) has never had a case of twins with this deformity, but he reported an interesting case in which a family of four children were afflicted. The first had a single harelip; the second had a cleft of the lip and alveolar process; the third, who died shortly after birth, a double cleft of the lip and alveolar process; and the fourth a single cleft palate and harelip. Robert H. Ivy (4) reported that in his practice he had never met with a case of tripartite cleft palate in twins. Thomas L. Gilmer (5) stated that in 40 years of active work in oral surgery he had never met with a case of twins with this deformity. Gordon B. New (6), of the Mayo Clinic, stated that he had never encountered this condition. Vilray P. Blair (7), of St. Louis, has never had, in his practice, twins with harelip and cleft palate, but said that he had received a photograph of stillborn twins with both harelip and cleft palate, from Dr. Frederick Koontz, of Louisville, Kentucky, and that Dr. Samuel Mixter, of Boston, had described to him a case of twins each of whom had harelip. The complete absence of cases of tripartite cleft palate and double harelip in "identical" twins in the literature would seem to justify the following case report and a detailed study of this unusual deformity.

Mrs. T., age 26, married 9 years, occupation housewife, nationality Dutch and American, five pregnancies as follows: first, March 31, 1914, child full term, lived 17 days, normal; second, March 29, 1915, child full term, living and well, normal; third, April 1, 1918, child full term, living and well, normal; fourth, August 13, 1919, child full term, living and well, normal; fifth, December 24, 1921, twins full term, living and well, both males, with congenital cleft palate (tripartite type), double harelip.

Patient's father is living and well, age 54, normal; mother is living and well, age 49, normal; brothers, four, are living and well, and all are normal; one sister, living and well, and normal. She has no aunts, uncles, cousins, or grandparents with cleft palate or harelip.

The husband's father died when 54, of influenza, otherwise normal. The mother is living and well, age 52 and normal. He has two brothers, living and well, and one who died from scarlet fever. All were normal. He has one sister, dead, and four living and well, and normal. One brother has two normal children. One brother has three normal children. One sister has four normal children. Two sisters are not married. Husband had one sister, whose husband is normal and whose family history is absolutely negative, gave birth to a child with cleft palate and harelip, which lived 2 months and died. She later gave birth to a normal child.

Patient's past history is negative, and examination of all systems was negative. She is a robust young woman, rather stout, who looks her age. Laboratory report shows a negative Wassermann, and there is no history of uterine disease.

On December 23, 1921, while working about the house, the patient noticed labor pains, but decided to wait until morning before entering the hospital. Her pains increased in severity during the night, and at 2 a.m. the bag of waters ruptured. At 9:00 a.m. she entered the University Hospital at Omaha where she was delivered by Dr. Gerald H. Beck, whose report follows:

"Examination revealed first child in left sacro-posterior position, buttocks well down on perineum, cervix effaced. The buttocks and scrotum of this child could be palpated. The bag of waters had ruptured. Delivery of frank breach with anterior rotation was done. Hyperactivity of the second child could be plainly discerned. The second

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child was delivered by podalic version. There was a slight mucous tear of the perineum, but repair was unnecessary. The placenta was about one and a half times larger than normal, somewhat oval in shape, and had one chorion with two amniotic sacs evenly dividing the placenta, which had a cord attached to each end of the oval. The first child weighed at birth 5 pounds, 5 ounces, and the second child 6 pounds, ⅛ ounce."

Examination of these twins revealed the following startling facts: *They were both of the same sex; the color of the eyes was the same in both; the color of the hair was identical,* and *the crown whirls were in opposite directions. A complete tripartite cleft palate and double harelip was present in both. In spite of these deformities, the similarity of appearance was striking.* In all other respects they were normal and apparently healthy.

The subject of twinning has always been one of great interest, and, together with the many associated problems, has stimulated the development of a very extensive literature. Two types of human twins are now recognized, viz.: those derived from two fertilized ova, dizygotic, and those developing from a single fertilized ovum, monozygotic. The former, while interesting from the standpoint of double ovulation and growth in a uterus illy adapted to multiple pregnancy, are no more closely related than other brothers and sisters of widely diverging ages. On the other hand, monozygotic twins present the extremely interesting problem of the possible factors and forces which cause two separate individuals to spring from a common cell. It has been thought that both share in the same hereditary factors; hence the term "identical" twins. The description given seems to place this pair of twins in the monozygotic type. An extended statistical study by J. B. Nichols (8) leads to the conclusion that about one-fourth of all human twins are monozygotic. It is, of course, admitted that such work can only be inferential, and that in order to settle the question absolutely, it would be necessary to establish the presence of a single corpus luteum in multiple birth. I have been unable to find a report of any observations on this point, which might easily be settled by studying the ovaries during a cæsarean operation for twins.

The relation of twins to placenta and membranes was studied by O. Schultze and commented on by H. H. Wilder (9). He concludes that cases like ours in which there is a single chorion and decidua surrounding two amniotic sacs with two umbilical cords are most probably cases in which a single fertilized ovum has developed two embryonic areas on a single blastodermic vesicle.

Extensive study of polyembryony has shown that in lower forms as well as in mammals, all individuals developing from a single egg have the same sex, to wit: caterpillars, when several hundred larvæ develop from a single egg. C. H. Danforth (10) made a study of the family connections in fifty pairs of twins in order to determine whether or not twinning is hereditary. He came to the conclusion that it has an hereditary basis but he was unable to find any law governing it.

Particular interest centers around the question of variation and heredity in monozygotic twins. With our present conception of transmission of heritable characters, "identical" twins must have in the beginning a single set of factors. If the two individuals vary it must be due to an unequal distribution of these heredity factors. The identity of such common heredity is characterized by the sameness of sex and the remarkable similarities of appearance so commonly seen in twins. That these points of similarity comprise more minute details was beautifully brought out by Wilder (11), who showed that finger prints were alike and that mirror imaging occurred with great frequency.

F. Sano (12) found that in the brains of "identical" twins the convolution patterns were strikingly similar. He also found that the crown whirls were on opposite sides of the median line, thus repeating the mirror imaging which Wilder found in the finger prints.

Bateson (13) has suggested that mirror imaging is evidence of symmetrical patterns. If it can be proved that finger prints and convolution patterns are heritable characters it will go far toward confirming Bateson's suggestion. It has long been recognized that such characters as eye and hair color are shared by both individuals. In our case the question arises whether or not cleft palate is an heritable character; then, if so, it must be shared equally by both twins. Following Bateson's suggestion, we must visualize

twins as representing symmetrical halves, just as we visualize symmetrical halves in the single born individual. Bilateral asymmetry in an individual is not unknown, and even cases in which the two eyes are of different colors have been reported. In such individuals we must assume that the differentiating factors have not been equally distributed to the two sides hence, asymmetry. The appearance of the same character in monozygotic twins depends then on an equal distribution of the determining factors to the two cell masses in the earliest cleavage. It seems conceivable that one early embryonal mass may receive a differentiating factor while the other does not; hence both would not only *not* have the somatic expression of the character in question, but only one of them would have the power of transmitting it. This accounts for the occasional asymmetry observed in "identical" twins.

Cleft palate and harelip are widely distributed congenital deformities, being more numerous in China, where they are still looked upon as marks of beauty, and rarest among the peoples of the South Sea Islands. Cleft palate is, as the name implies, a congenital cleft of the palate due to a lack of union of parts. Truman W. Brophy (1), in defining cleft palate, says: "The deformity, the statement of many authors to the contrary notwithstanding, is *not* the *result of defective formation in the palatine plates, nor congenital deficiencies of the parts in question, nor arrested growth of the palate, nor absence of a portion of the palatine tissue.* All children who have congenital cleft palate, with rare exceptions, have, in the palate at birth, the normal amount of tissue, although it is not united in the mid-line." Harelip is a congenital fissure or fissures in the upper lip due to failure of the superior maxillary and premaxillary processes to unite with each other in early embryonal life. The morphological explanation lies in the fact that there is a failure of union between the process globularis and the maxillary process, by which non-union the original connection of the oral sinus with the nasal pits is retained. Cleft palate and harelip occur singly but are frequently seen together. In classifying cleft palate, Professor Arthur Keith (14) quotes Gustaf Haug's (15) series, in which tripartite palate occurred in 15 per cent of cases, while in the London series there was 38 per cent. In the bipartite type the percentages were 22 and 23 respectively. In the case here reported we are dealing with the most severe form, the tripartite cleft palate. The premaxillary bone protruded and was separated by lateral fissures from each of the maxillary bones but joined the vomer. The case was further complicated by double harelip in both children.

The etiology of harelip is very closely associated with that of cleft palate. The predisposing causes, according to Brophy (1), are heredity and the presence of supernumerary teeth, or possibly intervening mucosa, preventing the submucous tissues from uniting. The exciting causes are undue pressure on the palato-alveolar inclined planes of the ununited maxillary bones, position of the fœtus *in utero*, malnutrition, etc. R. Clement Lucas (16) advances the theory that congenital absence or illy developed upper lateral incisors may be a forerunner or the first sign of an hereditary tendency leading in later generations to the formation of cleft palate and harelip. Professor Warnekros (17) argues for the theory of supernumerary teeth as a factor in the etiology of cleft palate by showing the tendency in cleft palate families to the development of supernumerary teeth. Prenatal impressions are oftentimes given as a lay cause of the deformities, but the time of the occurrence of such impressions is usually long after union of the bones is completed. Malnutrition and heredity are considered important factors in the etiology of these deformities. Uterine disease, syphilis, etc., especially during the early months of gestation, are influences not to be disregarded. All recent experimental work points to maldevelopment as a result of injury to the embryo. Such effects are selective only in so far as they tend to affect the part growing most actively at the time of the injury. And the results of a given injury on a large number of embryos of the same age are alike only in a broad way—not identical. It seems very unlikely that any injury would have affected these twins in an identical manner. However,

for every inherited character there is a germinal cause in the fertilized ovum. An inherited character is not to be thought of as the result of a single cause nor as the product of a single determiner. Whether the inherited character develops at all or not seems to be due to the presence or absence of one or more determining factors, but if these factors exist, the degree of development may be influenced by many subsidiary factors or modifiers (18). These subsidiary factors, transmitted independently of either the main factors or of one another, may be present in an individual who lacks the main determining factors, yet this individual may beget offspring from one who carries the main factors without the modifiers.

It is a well-established biological fact that an hereditary character, determined by some particular combination of inheritance units, by the union of the two parental cells is transmitted to the gamete.

Delayed dominance of character is well known in the color of hair and eyes of children, although dominance may become complete when adult life is reached.

When dominant and recessive characters appear in any zygote, the factors which determine these characters may exist in every cell of the organism throughout one generation, and yet there may be more or less complete separation of these characters in the next generation. This makes possible recombinations of physical entities and instabilities of types which under our present system of marriage and eugenics leads to the perpetuation of undesirable characters. No doubt this recombining of physical entities through separation of dominant and recessive characters plays an important rôle in the etiology of cleft palate and harelip, for one generation may be entirely free from the deformity, only to have it reappear in succeeding generations. Family trees of cleft palate and harelip cases show that, if heritable, it follows no known law, but may affect an entire family, a few, or even single individuals. It is well known that the greatest number are afflicted when both parents either have a family history of cleft palate or are themselves affected. W. L. Shearer (2) reports a positive family history in 95 per cent of over one thousand cases.

Fig. 1. Comparative study of both twins, showing the marked resemblance in spite of deformity.

Malnutrition plays such an important part in developmental anomalies that it may be a very important factor in the failure of union in the palate processes, as advanced by M. H. Cryer (19). If union does not occur when the bones are in contact during the fifth and sixth weeks of fœtal life, growth in the several elements of the palate, together with pressure from the surrounding parts, causes them to be separated from each other more and more as growth proceeds.

J. S. Foote (20), in studying cross sections of femurs in normal and cleft palate infants, reached the conclusion that cleft palate is a local evidence of a block in the development of the osseous system, due possibly to some disturbing factor such as the thymus. He found that bone development in a cleft palate infant at full term approximates that of a 4½-months fœtus.

In speaking of malnutrition as a possible etiological factor in cleft palate, Brophy (1) cites an interesting experiment carried out in the zoological gardens in Berlin. Of thirty-two jaguars, born of the same mother and the same sire within one year, all had cleft palates and died. At that time the jaguars were fed constantly on cold meat from which the blood had been allowed to escape. Later they were fed meat which was still warm and which contained blood, and out of twenty-five animals born, not one had a cleft. This seems difficult to bring into harmony with the theory of heredity. Yet it is known that if the larvæ of bees are fed upon "royal jelly"

which is rich in fats, they become fertile females or queens; if fed upon "bee bread" they become non-fertile females or workers. There are marked morphological differences between the workers and the queens, but even more striking differences in instincts and habits. All of these differences, whether in bodily structure or instincts, are determined by the character of the food and not by heredity. A recent article (25) on rachitis in children, which is supposedly purely a disease due to insufficient or improper diet, claims that a cure may be effected by exposure to sunlight or repeated exposure to non-toxic rays of the ultra-violet light. Is it any wonder that the etiology of cleft palate and harelip is as yet unsettled?

Other theories must also receive mention. In the formation of the teeth, the mucosa dips deeply down into the submucosa, forming the epithelial lamina which later contracts into the epithelial cord, from the distal end of which the enamel organ arises. This intervening layer of epithelium, together with the force exerted by the tongue and mandible upon the palate, with the body of the fœtus in the flexed position and the masticatory muscles active, may influence non-union. This is the theory advanced by C. W. F. Boedecker, of Berlin, and accepted by Brophy to be the best explanation yet given for cleft palate.

In discussing congenital malformations of the palate, Professor Arthur Keith (14), describing the union of the premaxillary bone with the lateral maxillæ during the amphibion stage of the embryo (fifth to sixth week), and that of the palate process in the mammalian stage (seventh to eighth week), called attention to the irregularity of growth of the several parts, but stated that the irregularity of growth is not the cause but the result of the cleft.

In tracing the earliest stages of the evolution of the face, we find that its apertures and cavities provide for contact of the central nervous system and alimentary tract with the outside world. The first step in differentiation occurs on the twelfth day, when the oral plate, consisting of a small area of ectoderm and entoderm, appears on the ventral surface of the head end of the embryo. Adjacent tissues grow upward, depressing the oral plate and forming the oral pit, the original oral plate becoming a part of the pharyngeal membrane. During the third week the first (22) and second visceral arches appear, the first dividing shortly after into the mandibular arch and the maxillary process, both of which grow toward the median line of the ventral surface of the embryo. By the sharp flexion of the head and neck, which occurs about the twenty-second day, and by the continued mesial growth of the mandibular arches and maxillary processes, the oral pit deepens and acquires more definite boundaries. By this time a thickening on the ventral wall of the forebrain vesicle has occurred at the upper margin of the oral pit. This thickened area becomes the unpaired nasofrontal process, on each side of which are seen the widely separated nasal pits in contact with the forebrain vesicle. During the fifth week the nasofrontal process thickens laterally to form the globular process and the inner boundaries of the nasal pits. Two ridges grow downward and forward from the nasofrontal process to form the outer boundaries of the nasal pits. These are the lateral frontal processes, and by their growth the nasal pits deepen and separate from the maxillary processes, but still retain their communication with the primitive oral cavity. The mandibular arches unite mesially at about the thirty-fourth day. A failure of union in the mid-line of the mandibular arches produces the deformity known as "aprosopia." At this time the tongue projects upward between the ununited halves of the maxillary processes and almost completely fills the mouth. It is to be emphasized that the position of the child *in utero* is such that the weight of the entire body is thrown upon the vertex, that the masticatory muscles are active and that the extreme flexion of the head and neck, with the tongue wedged in between the lateral halves of the maxillæ, tends to force the mandible, which is now united, into contact with the sternal region, and this forces the forming jaws together. If, now, undue pressure occurs or there is a remnant of epithelium intervening, or if there exists a state of malnutrition

causing a delay in ossification and growth, or if there be any combination of these factors, it is conceivable that a permanent cleft may result. If one bears in mind that part of the bones entering into the makeup of the palate belongs to the visceral arch skeleton and the other develops in the membranous wall of the cranial capsule, it is obvious that complications may arise from any of the above-named causes more easily than if all the bones developed from the same sources. There is, however, some controversy in the literature relative to the ossification of bones forming the palate. The maxillæ develop from the skeletal system, and their centers of ossification seem to vary in number according to the different authorities. The following is a list (22) which includes the centers of ossification for the premaxillæ:

One center: Camper, Cleland, Rosseau.

Two centers: Jamain, Mall.

Three centers: Serred, Meckel, Cruveilhier.

Five centers: Bĉclard, Sappey, Leidy, Poirier, Krause.

Six centers: Portla, Rambaud, Renault.

Seven centers: Weber.

According to Gauppe (1906), small cartilaginous islands appear in the alveolar process in the fourth to fifth months. These have no connection with the nasal capsule, and disappear during ossification of the upper jaw. This may account for the above diversified opinions. Franklin Mall (1906), claims that the maxillæ develop in two distinct parts, a medial (premaxilla), and lateral.

Each ossifies from a single center, which appears at the end of the sixth week and becomes united at the end of the second or early in the third month. Each of these centers gives rise to a part of the frontal process. The alveolar borders of the two bones unite before the frontal processes. At first the maxillæ lie lateral to the cartilaginous nasal capsule. Later this cartilaginous capsule is, to a large extent, absorbed, as a result of which the maxillæ help to bound the nasal cavity. To it becomes joined the *maxilloturbinale*, closing off some of the ethmoid cells, and the sinus maxillaris is formed. The formation of the alveolar process begins in the fourth fœtal month, and is completed after the twentieth year. Albrecht calls attention to a possibility of double centers of ossification for each premaxilla, which might explain a central cleft of the palate.

The palate bones (23) commence ossification in the vertical plate in embryos about the nineteenth millimeter stage (eighth week). It is a membranous ossification and begins at the side of the nasal cavity immediately internal to the palatine nerves. The orbital and sphenoidal processes are outgrowths of the vertical plate. The vomer arises from a bilaterally placed pair of nuclei which appear during the eighth week, near the back of the inferior margin of the cartilaginous nasal septum, but superiorly they extend on each side of the septum so as to enclose the septum between two thin plates of bone. These two plates gradually fuse from behind forward, but union is not complete until the age of puberty. Although the vomer develops on each side of the cartilaginous nasal septum and at its expense, it is regarded as a true membranous bone. This gives approximately six ossification centers in the formation of the palate.

CONCLUSIONS

1. This pair of twins belongs in the class of monozygotic twins.

2. Cleft palate results from non-union of parts, and at birth with rare exceptions the amount of tissue present is normal.

3. The etiology of cleft palate and harelip is not yet settled.

4. Heredity and malnutrition as causative factors, while of interest, are contradictory.

5. Embryonal development of cleft palate proceeds in the normal manner except for non-union of parts.

6. The number of ossification centers entering into the formation of the palate is still in dispute but is probably represented by two palatal, two maxillary, and two premaxillary centers.

7. All individuals have potential cleft palates until the third month of embryonal life is passed.

8. The mandibular arches unite prior to the maxillary processes and may prevent union of the maxillary processes by flexion of the chin on the sternum, causing pressure

on the palato-alveolar inclined planes of the ununited maxillæ.

9. I have been unable to find in the literature a case of tripartite cleft palate in "identical" twins.

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PELVIC TUMORS WITH SACRAL ATTACHMENTS[1]

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PELVIC tumors with sacral attachments, or "Ventral Tumors of the Sacrum," as we designated them in a paper read before the Western Surgical Association in 1912, are so rare that a careful study of the literature has shown but 30 of these cases reported. This includes the 2 cases here presented.

When we study the embryology of the sacrococcygeal region we appreciate why certain tumors whose occurrence is rare in other locations may readily be found here, tumors which exhibit one or all of the three primary germinal layers.

We learn that very early in the life of the embryo, the caudal intestine, the canal dorsalis, the chordæ dorsalis, primitive streak, medullary tube and vestiges, are formed in the caudal end of the spinal axis by the entoderm, mesoderm, and ectoderm.

We find as well that the central canal of the spinal cord and the primitive alimentary canal are in communication around the notochord as the neurenteric canal.

When the proctodeum invaginates and finally forms an opening into the primitive gut, this opening occurs anterior to the neurenteric canal; therefore, there is left a small portion of the gut between the newly formed anus and the neurenteric canal, the so-called "postanal gut": this hind gut and the communicating neurenteric canal finally become obliterated and are then designated as "obsolete canals."

An understanding of the embryology of this complex region lucidly explains the multiple types of tissue which enter into fœtal vestiges remaining ventral to the sacrum, and the wonder is not that tumors are found here so rarely, but rather that they are not of much more frequent occurrence.

These tumors ventral to the sacrum exhibit such a great variety of tissues, which are sometimes hard to differentiate, that they come under the classification of dermoids, mixed tumors, or the teratomata; in addition to these we must add the very rare chordoma, arising from the anlage of the notochord, for 6 cases of this type of tumor have been reported attached to and in front of the sacrum.

Uncertainty as to the etiology of these tumors is responsible for the many theories advanced by various observers who have at-

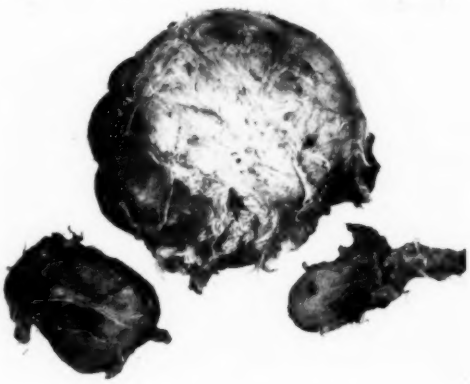

Fig. 1. Case 1. Gross specimen.

Fig. 2. Case 1. Tumor split.

[1]Read before the Southern Surgical Association, Pinehurst, North Carolina, December, 1921.

Fig. 3. Case 1. Area in large tumor showing stroma infiltrated by eosinophiles. 250×.

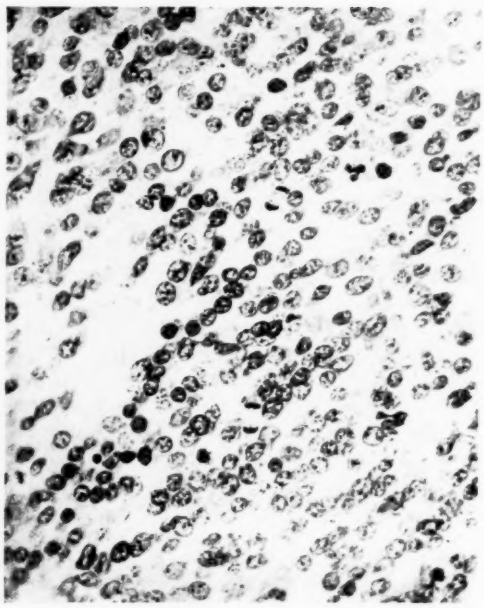

Fig. 4. Case 1. High power view of embryonic cells in large tumor. Note mitoses and variations in size of nuclei. 250×.

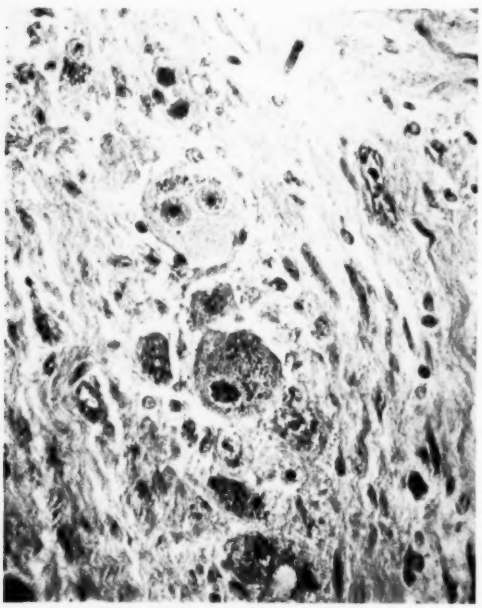

Fig. 5. Case 1. High power view of ganglion-like cells in small tumor. Note pigment and double nuclei. 500×.

tempted to explain their origin. The March-and-Bonnet theory has accorded a genetic equality to all composite dermoids, embryos, and parasites.

Borst asserts that disturbances in the caudal region may make it possible for portions of the vestiges coccygiens to be transplanted to the ventral side of the sacrum, and there give rise to the tumors.

Middledorpf, Ritsch and Masse, believed these tumors arose from local disturbances of development of misplaced tissue anlage of the postanal gut, medullary canal and neurenteric canal, in conjunction with ectodermal and mesodermal inclusions.

Virchow, Ahlfeld, and Henning found it difficult to accept the monogerminal theory as explanation of the complex teratomata where were found fragments of organs, bone, or fœtal limbs. This skepticism gave rise to the bigerminal theory, which postulates that these tumors represent an incomplete monstrosity or twin, a parasite engrafted upon its host, a so-called suppressed fœtus.

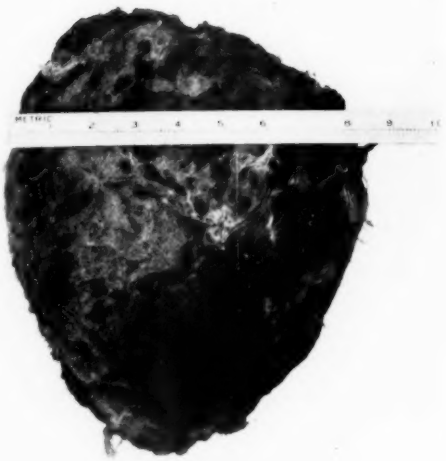

Fig. 6. Case 2. Gross specimen.

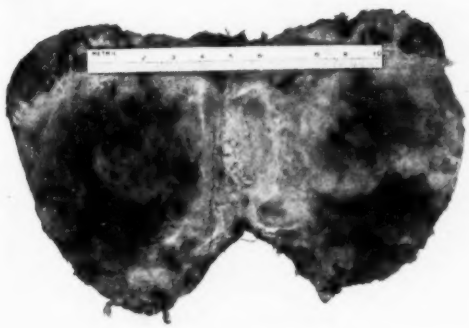

Fig. 7. Case 2. Tumor split.

Another theory advanced, although not generally accepted, is, that the tumors with their three embryonic layers are originated by a blastomere or impregnated pole cell which has been cast out of the complex.

Adami has advanced an ingenious theory, derived from his observations on the growing points of plants, where in the root and stalk the cells of the growing points are projected and crowded apart by the division of the daughter cells between them.

In the mammal he believes these growing points are located at the base of the brain, near the pituitary body, and in the region of the sacrum.

He affirms that with the complete development of the nervous system, further development of the growing points is arrested. If then, through some exciting agent, the growth continues after the mammal has reached maturity, he believes the cells have the peculiar property of reproducing the three primary germinal layers: this theory Adami claims will explain the etiology of the teratomata and mixed tumors which occur at the base of the skull and in the sacral region.

These pelvic tumors ventral to the sacrum vary markedly in their morphology, ranging from the simpler inclusion dermoids showing but one germinal layer, to tumors representing nearly all types of tissue: in some of them the tissues are difficult or impossible of differentiation, while in others a preponderance of one type of tissue identifies them, as instanced by the notochord tumors with the typical vacuolized cells suspended in a gelatinous matrix, or in the very rare tumors where ganglionic cells or neuraxones have been demonstrated and uphold the theory of neurenteric canal origin.

Most of the tumors under discussion have been reported to be definitely encapsulated and were readily shelled off from the sacrum.

They have been confused with all of the pelvic neoplasms, including fibroid tumors of the uterus, ovarian cysts, tubal and abdominal pregnancies, abscesses, intraligamentous cysts, anterior spina bifida and hypertrophied prostate.

They have generally been considered benign, yet Parin collected 6 cases which proved to be malignant, and Pringle, Fowler, and Lund report local recurrence and metastasis. Both of my cases died of recurrence.

Eighty per cent of the chordomata have been reported to be malignant.

These tumors are rarely recognized until they encroach upon neighboring organs the uterus, bowel, or bladder, exhibiting symptoms of pressure or obstruction.

While they are easily palpated by rectum or vagina, their differentiation is sometimes very difficult. This explains the attempts to remove them by the abdominal route, a

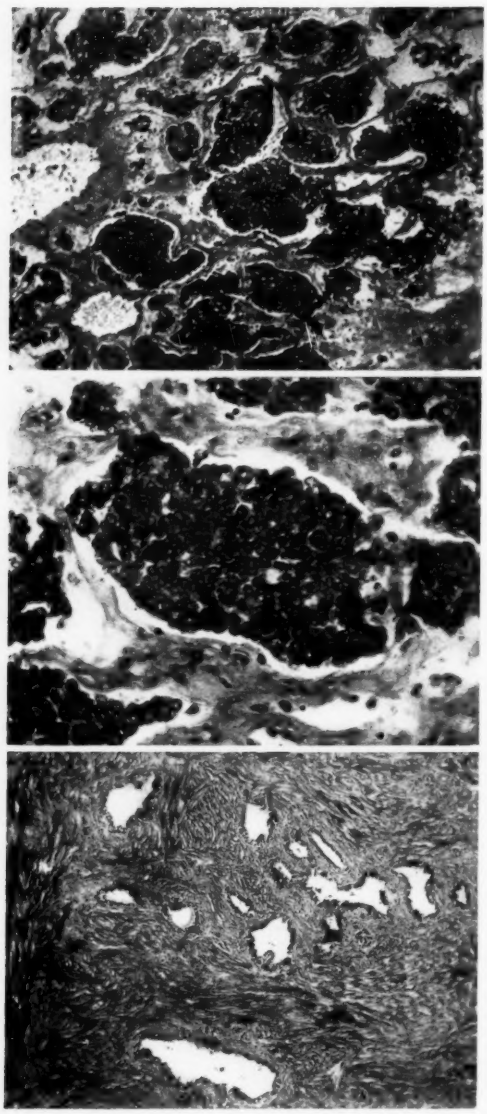

Fig. 8 (at top). Case 2. Low power view of a typical area. The cellular cords anastomose freely and are separated by loose fibrous connective tissue.

Fig. 9 (middle). Case 2. High power photomicrograph of area in Figure 8.

Fig. 10 (below). Case 2. Photomicrograph of area of tumor showing glandular alveoli which are separated by dense stroma containing bundles of smooth muscle. This structure is identified as prostatic tissue.

difficult and dangerous method owing to their inaccessibility and the difficulty of controlling hæmorrhage.

We believe that owing to the demonstrated tendency to malignant degeneration, these tumors should be removed when recognized, and we are convinced that they should always be attacked from behind through the sacrococcygeal route. The modified Kraske approach is ideal for the larger tumors; it permits them to be shelled out with little difficulty, usually without invading the peritoneum, and facilitates the control of hæmorrhage.

Because of the rareness of this tumor, and because the histological structures vary so markedly, we are constrained to report two cases which have occurred in our experience. The first case was reported in 1912, and therefore will be briefly abstracted.

Case 1. Miss M. B., age 16, pregnant and at full term. Was in active labor for 24 hours. There had been no engagement of the head. Bimanual examination revealed a pelvic tumor which was thought to be a fibroid in the posterior cervical lip. This growth prevented delivery *per vaginam*. On August 28, 1912, a cæsarean section was done and the child delivered. Through the abdominal incision we were enabled to determine that this tumor was attached to the sacrum and could not be removed by this abdominal route.

On October 2, 1912, as this woman was cachetic, she had a low hæmoglobin and the tumor was rapidly increasing in size, she was subjected to an exploration. The exposure was made through the sacrum by a typical Kraske incision. The tumor was found to be retroperitoneal with a small attachment to the sacral periosteum, and crowding the vagina and rectum. It was removed with little difficulty. The patient was discharged from the hospital 5 weeks later.

Dr. H. E. Robertson, now professor of pathology in the Mayo Clinic, in a careful study of this unusual tumor reported it at length. The tumor was 9 centimeters in length and 6 centimeters in diameter, and definitely encapsulated. There was a smaller tumor attached to the main tumor 3.5 centimeters in diameter. In the study of these tumors Dr. Robertson's conclusions were as follows:

"The large tumor shows a loose, rapidly growing connective-tissue stroma in which are nests of embryonic cells growing in syncytial-like masses and suggesting malignancy in their manner of growth and appearance. Areas of hæmorrhage, necrosis, and calcareous degeneration demonstrate the atypical character of the tissue, its rapid development and imperfect blood supply

"The smaller tumor suggests a neuroma in its general character, although neuroglia fibrils have not been demonstrated.

"That the tumor springs from some misplaced remnants of the terminal portions of the neural tube seems a logical conclusion. That portions of it have developed abnormal powers of proliferation and shown signs of malignant change, while other portions have in an imperfect manner reproduced the adult type of nerve tissue, is apparently the only explanation which accounts for these rather widely diversified tumor masses."

It is interesting to note Dr. Robertson's original observation as to the malignant characteristics of the tumor. This patient died a year later in the country from a local recurrence. The tumor masses removed by the local physician and sent to the University of Minnesota for examination, reveal the following:

"Microscopically, the tumor is composed of small irregular masses and cords of cells separated by a large amount of loose fibrous stroma in which there is a considerable amount of diffuse hæmorrhage. The cords are composed of deeply stained nuclei embedded in a common cytoplasmic mass, that is, there is rarely a definitely outlined cell body. No nerve cells such as occurred in the primary tumor can be identified.

Diagnosis: Recurrence of malignant neuroblastoma."

Case 2. E. T., male, age 27. The difficulty was first noted 4 months ago when the patient noticed pain in the rectal region and some degree of constipation. No blood was passed by rectum and he had no hæmorrhoids. He found some slight difficulty in urinating. There was no loss of weight. He was told he had a fissure *in ano*.

Examination March 5, 1921. Well-nourished boy with no abnormality other than the local condition. Rectal examination revealed a hard, smooth, rounded mass, almost completely filling the true pelvis. The mass was not tender and could not be differentiated from the prostate. The bladder was readily catheterized.

X-ray examination showed a normal sacrum and coccyx. X-ray of the bladder filled with sodium bromide solution revealed this viscus pushed upward out of the true pelvis and lying in close apposition to the anterior abdominal wall. No irregularity in the contour of the bladder could be demonstrated by the X-rays.

Under gas anæsthesia this mass was explored with a hollow needle but with a resultant dry tap.

Clinical diagnosis: Ventral tumor of the sacrum.

Operation March 9, 1921, at the Northwestern Hospital. Under gas and ether anæsthesia, the mass was approached by a modified Kraske incision, removing the coccyx and the sacrum below the third foramina. The mass was found definitely encapsulated, the capsule being roughly about one-fourth of an inch in thickness. The tumor was attached to the hollow of the sacrum. The prostate gland was not seen or felt during the operation. The gut lay anterior and to the left of the mass. The whole mass was wholly extraperitoneal and was shelled out with relatively little hæmorrhage.

This tumor was 8½ centimeters wide and 10 centimeters long. This man had a prompt local recurrence and died 3 months later on June 5, 1921, at which time his pelvis was completely filled with the tumor mass. It was impossible to get a complete postmortem so portions of the tumor were removed from the pelvis. The report of the primary tumor and of the recurrence by Dr. E. T. Bell, professor of pathology, University of Minnesota Medical School, is as follows:

"Microscopically the structure of this tumor varies notably in different portions. The most common appearance is a network of thick anastomosing cords of cells which are separated by a small amount of dense fibrous connective tissue. The cords are composed of closely packed, slightly vesicular nuclei, embedded in a common mass of cytoplasm without the formation of any definite cells. There is no differentiation into any recognizable tissue. The appearance of the tissue suggests an epithelial character.

"Other areas of the tumor show much more abundant connective tissue with a corresponding diminution in size of the epithelial cords. In some places the cords are broken up into small masses separated by large amounts of connective tissue. The structure of the cords of cells is everywhere, however, the same.

"One small portion on the margin of the tumor shows definite prostatic tissue. The surgeon does not report the tumor as attached to the prostate. The prostate tissue is encapsulated. The presence of this tissue suggests the possibility of the tumor having its origin from the prostate gland. If this interpretation be correct, we are dealing with a malignant prostatic tumor, apparently of epithelial nature.

"The recurrence shows a structure similar to that of the original tumor except that no prostatic tissues are found."

The interesting feature of this tumor is that there is only one tissue in it which can be definitely differentiated, and this tissue is prostatic tissue. This tissue suggests the interesting possibility that this tumor may represent an embryoma bearing the same relation to the prostate as do some of these tumors of the testicle to that organ, and that it might possibly be classed as a teratoma of the prostate in which development was one-sided. We are, however, unable to find any reference in the literature which substantiates such an assumption.

Inasmuch as it has been impossible definitely to differentiate this tumor, it is not important

by what name we designate it, so long as we recognize that we are dealing with an embryoma of malignant tendencies. Therefore, the writer has stressed the importance of the removal of these embryonic tumors ventral to the sacrum, as he believes that most of them tend to malignant degeneration.

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SUPERNUMERARY KIDNEY WITH URETER OPENING INTO VAGINA

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PROBABLY the kidney is more frequently congenitally malformed than any other organ in the body. Under the heading of malformation many varieties are seen. Gerard, in 1905, made a study of the world's literature and found 527 cases of renal anomalies. Dorland, in 1911, collected from the literature from 1898 to 1910, 123 cases of renal anomalies. Both practically arrived at the same conclusions as to the frequency the following anomalies are found: horseshoe kidney, in 25 per cent; rudimentary kidney, in 9 per cent; absence on one side, in 15 per cent; displaced kidney one or both in the pelvis, 16 per cent; supernumerary kidney, 4 per cent.

Kretschmer, in 1915, reported an undoubted case of supernumerary kidney. He quoted cases from Sutter, who tabulated 19 cases. Sutter's cases are probably double kidneys. All are agreed that true supernumerary kidney is the rarest of all malformations. To accept a kidney as supernumerary, it must be a separate kidney enclosed in its own capsule, either lying free from the other kidney, or attached to it, having its own blood supply, pelvis, and ureter. Its ureter may anastomose with another ureter, or enter the bladder, giving a third ureteral opening; or the third ureter may open and drain the supernumerary kidney outside of the body, or into the vagina or rectum.

Our case is unique in that a duplicate of it cannot be found in the world's literature. The ureter in our case, as will be described in full later, did not anastomose with another ureter, but passed directly downward and opened into the vagina, near the cervix giving rise to a uretrovaginal fistula.

A brief review of the embryology of the kidney and ureter will explain in a measure how the anomalies of the upper and lower urinary tract may arise.

EMBRYOLOGY

In the development of the kidney, we are concerned with the growth of three definite and distinct organs, which are formed at different stages in the growth of the embryo. These organs are known as the pronephros, the mesonephros, and the metanephros. The first two degenerate, while the third remains the permanent kidney. It so happens that the second begins to develop when the first degenerates, and the third begins to develop, as the second degenerates, so that a constructive and a destructive process is going on at the same time. The pronephros carries on an excretory function during its existence. It is thought that the mesonephros exercises a similar function and does form the beginning of the metanephros and the reproductive apparatus. The metanephros goes on to complete development and is the active excretory organ.

The metanephros may be divided embryologically into two portions, the secretory glandular portion and the efferent apparatus. From the latter develops the ureter, the renal pelvis and the collecting tubule system. The anlage of the ureter arises as a hemispherical outgrowth of the primary excretory duct. The short ureter grows at first dorsally, later cranially, and when it gains the dorsal surface of the mesonephros radical outgrowth of the collecting tubules takes place. While the ureter is still in a period of outgrowth, the primitive pelvis elongates in a craniocaudal direction and thus acquires

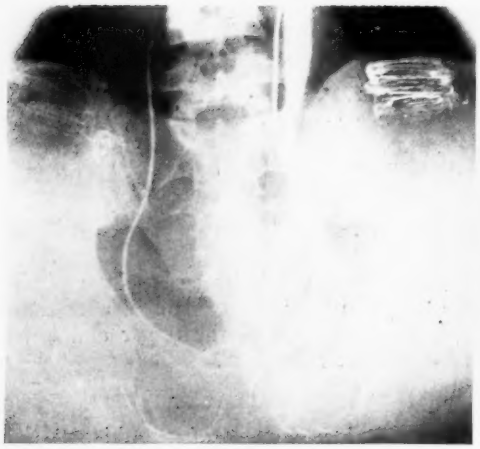

Fig. 1. Lower pelvic region showing 3 catheters and beginning of dilated ureter.

Fig. 2. Pyelogram showing 3 small calyces at end of dilated ureter. Right kidney not injected. Catheters in left kidney and right kidney.

its poles. The secretory glandular portion of the metanephros is derived from a group of cells known as the metanephrogenic tissue which accompanies the ureter in its ascent and which always covers the primitive renal pelvis. The tissue breaks up to form collecting tubules.

There may be an absence of one or both kidneys. In such a case the anlage of one or both fails to bud off from the excretory duct, or if the anlage were formed it was either arrested or absorbed in the early course of its development. Absence of the ureter and maldevelopment of the reproductive organs may result. If the renal bud sprouts early or if the division takes place at different points, and if each division is surrounded by an independent mesochyme, there would be a double secondary anlage for the kidney. These anlagen are usually placed one above the other. They either remain distinctly separate throughout the period of their growth, forming two kidneys, on one or both sides The supernumerary kidney may be accounted for in this way. They may fuse at some time during their course of development, forming one kidney on each side, or both sides may fuse, forming a large mass of kidney tissue.

The blood supply to the buds determines the ultimate size of the kidneys. If there is a lessened blood supply to either bud, the bud fails to grow at the same rate as the bud with a greater supply, resulting in a rudimentary kidney. In our case of the accessory kidney, the blood supply was separate and distinct. The artery coming off from the aorta at a higher level than the artery supplying the larger kidney. The artery was very much smaller. The vein was single and did not divide at the pelvis.

Changes in the ureter. Abnormalities of the ureter are dependent upon the renal bud, while anomalies of the kidneys result in abnormal development of the mesochyme. Abnormalities of the ureters may be divided into two classes: the incomplete double ureter, and the complete double ureter. In the former, the ureter has a common opening in the bladder, and in the latter each ureter has its own separate opening. If the renal bud divides too early or if the division extends into the ureter segment, the splitting formed in the ureter itself may remain here permanently and any variation might exist, from exaggeration of the upper and lower pelvis to an incomplete reduplication.

If the splitting of the renal bud is so complete, that it is affected by the shortening of the segment of the wollfian duct, lying between it and the cloaca, it is possible

Fig. 3. Pyelogram shows right kidney with its calyces. Dilated ureter on right side. Roentgenographic catheter in left side.

Fig. 4 (at left). Anterior view of gross specimen. Capsule partly removed, showing kidney substance, large dilated ureter.

Fig. 5. Posterolateral view of gross specimen. Capsule removed at upper part to show kidney substance. Lower roughened part of capsule is point of attachment of supernumerary kidney by fibrous band to upper pole of right kidney.

for each division to acquire a distinct orifice in the duct, resulting in a double ureter. In complete double ureter, the ureter from the upper surface has a lower orifice in the bladder, lying somewhere between the higher opening of the dorsal ureter and the opening in the genital duct.

Our patient was referred by Dr. E. Leopold, with the history that she has been having a vaginal leakage of urine, from as far back as she could remember. Some eight to ten years ago she had an operation performed for the leakage, which was unsuccessful. The patient was sent to Hebrew Hospital for a cystoscopic examination.

Y. G., age 29, single, seamstress, entered the Hebrew Hospital March 20, 1922, complaining of dripping from the vagina.

Present illness. As far back as patient can remember there has been a constant leakage of urine from the vagina, both nocturnal and diurnal necessitating the wearing of a vulval pad. In addition the patient stated that she voids normally from the urethra with frequency at times, voiding more often after sitting down than when on her feet. There is no polydypsia, no pruritus. During the past 18 months there has been more discomfort than formerly. In 1907 patient was operated on. A plastic operation was done for vesicovaginal fistula. The operation, however, proved to be of no benefit to patient. Believing her condition to be incurable the patient made no further effort to secure relief.

Previous history. Patient has always enjoyed fairly good health. Had measles in childhood, rather frequent frontal headaches, submucous resection for frequent "colds," some palpitation and dyspnœa on exertion.

Genito-urinary, negative; menstrual history, normal; habits, unessential; accidents, none.

Family history, unessential.

Physical examination. General physical examination shows a well developed, well nourished woman, with negative physical findings, except for the following: There is spasm and rigidity over entire rectus muscle on right side with tenderness most marked in the flank and right lower quadrant. No tenderness over kidneys, neither kidney palpable.

Laboratory examination of urine shows alkaline, specific gravity, 1013, albumin positive, microscopic negative. Hæmoglobin 80 per cent (S); red blood cells, 3,864,000; white blood cells, 8,150; differential count normal.

Genito-urinary examination shows, vulva wet, with urine oozing from vagina. Urethral orifice normal. Patient catheterized and bladder emptied. Urine continued to ooze from vagina.

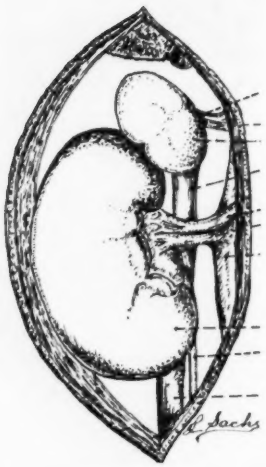

Fig. 6. Schematic drawing showing supernumerary kidney.

Vaginal and cystoscopic examination. As the outlet was virginal, it was very difficult to introduce a speculum, without causing a great deal of discomfort, so we injected into the perineum about 15 cubic centimeters of 1 per cent solution of novocaine. This had its desired effect in anæsthetizing the parts, so that we could introduce a speculum to search for the leakage in the vagina. A small opening about 7 millimeters was found in the anterior wall of the vagina, to the right of the cervix, which dripped urine. The bladder was now filled with a methylene-blue solution, and the opening in the vagina watched for the escape of any blue solution, but none came through. A No. 7 renal roentgenographic catheter was passed into the opening, and after a little patience it was made to pass on upward about 6 inches. The cystoscopic examination was made by the water method. The ureteral orifices were normal, one on either side, and perfect in appearance. The catheters were passed in each ureter as far as the pelvis of the kidney. Urine was collected from all three catheters. The one in the vagina was labeled F. and the other catheters were labeled as to their respective sides right and left. The rate of dripping was three drops each from right and left to one in F. The urine was collected from all three catheters and examined chemically and microscopically. It was negative from all three catheters, cultures were made from all three catheters, which were sterile. We next made an intravenous phenolsulphonephthalein test, and collected for 20 minutes: right side 30 per cent, left 42 per cent, F. 2½ per cent. We next made a roentgenogram of the roentgenographic catheters in their respective places. This was done to locate our F. catheter. From the roentgenogram, the F. catheter was located on the right side. The right kidney and F. catheter were filled with opaque solution, and a pyelogram taken (Fig. 1). The pyelogram shows the right kidney beautifully outlined with its calyces, and a large hydro-ureter. Two days later, we again cystoscoped the patient, for the purpose of determining whether we had a kidney with a double pelvis, and if the ureters anastomosed in some part of their course with one ending in a blind pouch. The pyelogram, Figure 2, shows clearly that it did not anastomose with the other ureter in any part of its course, but at the extreme end of the ureter, there can be seen three small rudimentary calyces.

We summed up from our cystoscopic examinations in the following manner. The opening in the vagina was coming from a separate ureter, which did not anastomose with the right ureter. There was a normal pelvis in the right kidney. The large hydro-ureter ended with rudimentary calyces, with a 2½ per cent of phenolphthalein output.

We made a pre-operative diagnosis of supernumerary kidney with a hydro-ureter opening into the vagina. We had every reason to believe that this large dilated ureter was the result of the plastic operation, which was done some years ago, and narrowed the outlet of the ureter. The small diameter of the outlet dammed the urine back, and dilated the ureter. The kidney being small could not dilate. This gave the large hydro-ureter, as shown in the pyelogram, Figure 3, and in the photograph of the gross specimen.

Dr. Leopold and I consulted as to removing this supernumerary kidney, and we both agreed that under the circumstance, it was the best thing to do, even if we had to remove the right kidney. To attempt a plastic operation by putting the fistulous opening into the bladder, would shorten the vagina, and if it did not heal, the patient would be in worse condition. To shorten the vagina in a young woman by a plastic operation was out of the question, because, if pregnancy should occur in the future, there would be little hope for a normal delivery, or the bladder might be seriously injured during the delivery.

Patient agreed to have done whatever we thought was necessary in order to cure her, as she had been in constant discomfort since she could remember.

Operation. Through a right anterolateral incision the posterior peritoneum was opened, exposing the perirenal fat, which was separated by blunt dissection. A normal right kidney was found lying in the renal pocket. At the upper pole of the kidney was a small mass of kidney tissue 4 centimeters by 4 centimeters. Each kidney was enclosed in a distinct separate capsule, the capsule being adherent at one point. Supplying the accessory kidney was a small artery and vein. The artery branched from the abdominal aorta at a point just above the artery supplying the larger kidney.

The artery and vein to the supernumerary kidney being very short, it was necessary to clamp and cut them before the kidney could be raised out of its bed. The accessory kidney was now separated from its line of fibrous attachment to the capsule of the other kidney. A slight drawing upward of the detached accessory kidney showed the larger hydro-ureter passing posterior the blood vessels and pelvis of the other kidney. The ureter was dissected downward for about 5 inches. Between clamps it was removed by cautery. The stump was ligated with black silk and inverted. A cigarette drain was introduced, and the wound closed in usual manner.

Time of operation, one hour. Patient left operating room in good condition.

Drain was removed on fourth day, sutures on eighth day, and wound had healed perfectly.

Postoperative notes. Patient made an uneventful recovery. There has been no leakage from the opening in the vagina.

The specimen is a small kidney, with a large dilated ureter. There are two lobes in the kidney substance. The kidney measures 4 centimeters by 4 centimeters. The kidney is completely enclosed in a capsule, which strips easily. The posterior surface is slightly roughened, and there is a thin fibrous band running into the kidney substance. In this small band of fibrous tissue, there is seen a small artery and vein. The vein does not branch. On section the kidney shows perfect pyramids, but they are dwarfed. The pelvis of the kidney is dilated, and does not show a definite outline from that of the ureter. The diameter of the pelvis is 0.5 centimeter. The ureter measured 12 centimeters long. It is of a redish white color. The walls are thickened. The diameter is 0.5 centimeter.

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DOUBLE SCROTUM WITH GANGRENE FOLLOWING STRANGULATION

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A SINGLE man aged 54 was admitted under my care at the Auckland District Hospital and gave this curious history. He had, he said, always been different from other men, his scrotum being in two parts. Each part was very pendulous and this annoyed him. Five days previously a brilliant idea had struck him, and he had taken the two sacs with their respective testicles and had tied them in a single knot across the dorsum of the penis. Soon afterward they began to swell and he was unable to untie them. Daily they increased in size and darkened in color.

Examination revealed two tumors almost black in color and with a thin, evil-smelling discharge oozing from them. The upper tumor, the left scrotum, was of the size of the closed fist and lay above the pubis. The right scrotum was as large again as the left and lay in the perineum. The pedicles of the two scrota were tied in a firm knot across the pubis. Beneath lay the penis greatly enlarged by œdema. There was no possibility

Fig. 1. Surface view of specimens from behind.

Fig. 2. View from the front, scrota opened and testicles showing.

of untying the knot, so the right scrotum was laid open. It and the contained testicle were completely gangrenous. An incision was made around the right external abdominal ring, the spermatic cord was severed, and the right scrotum removed. The left scrotum was then explored, and it and the testicle were likewise found gangrenous and were removed. It was interesting then to see that both scrota had been removed by circular incision at the external abdominal rings. The raw area left on each side was about the size of a penny. There were no scrotal attachments whatever to the perineum. The knot, which had rested on the dorsum of the penis, had formed a deep pressure sore there. The man made an uneventful recovery.

I cannot find in the literature to which I have access any account of so completely separated portions of the scrotum, or of any accident similar to the one described.

REPORT BY PROFESSOR A. M. DRENNAN

Reference No. D.B. 1–1425. The specimens are two in number and very similar in appearance. Each specimen has a narrow pedicle consisting of the usual structures of a spermatic cord with fatty tissue around, the whole covered by skin in which are hairs. This pedicle is continuous with an oval mass 4 inches long, covered by hairy skin which is purplish brown in color and the superficial epidermis is detached in parts. On cutting into this oval mass it is seen to consist of fatty tissue infiltrated with blood and with greatly engorged blood vessels; lying at the lower pole is a testicle, one and three-quarter inches long, with epidermis and tunica vaginalis. The testicles, epididymis, and surrounding tissue are all dark red from hæmorrhage into the interstices of the tissue.

Fig. 3. View of cut surface of both specimens. The testicle is seen at the lower pole, but it and adjacent tissue are not clearly defined owing to the hæmorrhage in both.

With the exception of the hæmorrhage the testicle and cord appear normal except that each testicle has a complete scrotum to itself, that is, the scrotum has been completely divided into two separate portions in this case. The hæmorrhage and congestion are the result of strangulation from the manipulation carried out by the patient.

Reference to the photographs will make the above clear.

The condition, as far as I know, is extremely rare and I have no references to it in the literature at my disposal.

RENAL AND HEPATIC INSUFFICIENCY IN OBSTRUCTIVE JAUNDICE

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OPERATIONS on patients with obstructive jaundice offer three avenues of danger, aside from the so-called accidents of surgery: (1) hæmorrhage, (2) uræmia, and (3) hepatic insufficiency.

Hæmorrhage. The extreme danger from hæmorrhage in the presence of jaundice is well known. In a previous review of the necropsy findings in twenty-nine cases of obstructive jaundice, it was shown that serious postoperative hæmorrhage occurred in more than 50 per cent. A method of pre-operative preparation of patients was described. That such preoperative preparation has met with success is evident from the fact that in the last series of thirty-four patients with obstructive jaundice who received this preparation, there was but one case of serious postoperative bleeding.

Uræmia. A large percentage of patients with obstructive jaundice have a certain amount of albumin and some casts in the urine. If albumin is slight and casts few, the blood urea only moderately elevated, and the urine output satisfactory, operation is warranted, provided a normal blood coagulation time exists.

Case 1 is illustrative of the fact that renal insufficiency occurs as a terminal event in cases of obstructive jaundice in which operation has not been performed.

Case 1. (A313919.) Mr. J. V., age 68, entered the Clinic October 5, 1921, with a history typical of gallstone colic followed by jaundice which became deeper progressively and was marked at the time of examination. The stools were clay colored. A twelve-hour specimen of urine contained a large amount of albumin, hyaline and granular casts, and leucocytes. The coagulation time of the blood was 19 minutes.

The patient was referred to the hospital October 8 for pre-operative preparation, but because of the nausea and vomiting it was thought best first to place him under observation for 24 hours. During the next 42 hours the jaundice deepened; the patient passed only 180 cubic centimeters of urine, in spite of a subcutaneous intake of 1800 cubic centimeters of normal salt solution. Occasionally blood was noted in the vomitus. The patient became restless and noisy, then drowsy and stuporous. October 10, the day before his death, the blood urea was 294 milligrams for each 100 cubic centimeters, and creatinin 5.8 milligrams. Necropsy revealed chronic diffuse nephritis and hæmorrhage into the gastro-intestinal tract. An impacted stone in the common duct was the cause of the complete obstructive jaundice. Operation was defe red on account of the high coagulation time of the blood and the renal insufficiency.

In a large percentage of the cases of obstructive jaundice after ether anæsthesia was used, the blood urea became double the preoperative quantity the second or third day after operation. When local anæsthesia, by infiltration of the abdominal wall, was combined with a slight amount of ether (usually 30 to 75 cubic centimeters), the rise in the blood urea was noted in a smaller proportion of the cases. As a rule such a rise 48 to 72 hours after operation gradually disappears, and without other trouble the patient has a steady normal convalescence. Unfortunately some patients do not get on so well. If, after operation, there is an increase in the cholangeitis or if biliary drainage becomes insufficient, there may be a greater retention of bile with an increase in the jaundice and in the blood coagulation time and a concomitant increase in nephritis with rising blood urea. These patients sometimes show an alarming picture of uræmia and may not recover.

The findings in a typical case of obstructive jaundice in which the patient died of renal insufficiency secondary to operation are as follows:

Case 2. (A373925.) Mr L. F., age 64, was examined in the Clinic, October 3, 1921. Six weeks before, he had developed jaundice and generalized pruritis, clay stools, and marked constipation. The urine contained albumin 2 (on the scale of 1 to 4), and casts 1. The coagulation time of the blood was 10 minutes. Cholecystogastrostomy for carcinoma of the head of the pancreas was performed. The third day after operation urinary retention necessitated catheterization; marked hæmaturia followed. The fourth day after operation, the blood urea was 228 milligrams; it rose to 360 milligrams and the creat-

inin to 3 milligrams on the eighth day. The patient was transfused twice; he died on the ninth day apparently from uræmia. Necropsy revealed marked nephritis, blood in the urinary bladder, in the gallbladder, and in the gastro-intestinal tract.

Neither this patient nor the patient in Case 1 was given calcium chloride intravenously.

The only treatment indicated in these cases is for any impending uræmia. Drains should be carefully inspected to see that they are not obstructed.

Hepatic insufficiency. Too little consideration has been given to the incompetent liver as an obstacle to the recovery of the patient with obstructive jaundice. Because of the remarkable compensatory and regenerative abilities of the liver, it has been difficult to obtain exact data with regard to liver failure. It may be safer to regard these patients as suffering from lack of sufficient hepatic function rather than from hepatic insufficiency. The trouble may not be so much an intrinsic lack of vigor of the liver cell as the liver's inability to function properly because of obstruction in the avenue of excretion. The term cholæmia is sometimes used to signify the symptoms accompanying the retention in the blood of toxic products which the liver has failed to eliminate. Cholæmia means bile in the blood, but as a clinical expression it is often used loosely to mean almost any untoward syndrome occurring in jaundiced patients. Terms such as cholæmic nephritis and cholæmic hepatitis, might be used. It would seem better simply to use the word as meaning the presence of bile in the blood. Be this as it may, it is certain that patients with common duct obstructions present a so-called biliary cirrhosis of various degrees, more correctly central atrophy and cholangeitis. When this is so marked that the liver is a yellow, bile-stained organ, shrunken to two-thirds its normal size, the prognosis as to the outcome is very serious. An alarming percentage of patients thus affected die from lack of hepatic function.

At necropsy in such cases the liver is small and yellow, sometimes weighing less than 1000 grams, although in some instances it may be larger than normal. There are many bile thrombi in the canaliculi of the central portion of the lobules. The hepatic cells of the central zone are atrophied, although there is a great deal of fairly good liver tissue in the periphery of the lobules. However, the latter often shows slight hydropic change or a moderate amount of fine fat granules as revealed by Sudan III stain. There is scarcely enough definite abnormality present to make the liver inadequacy recognizable from a morphological standpoint. On the other hand, the better known syndrome of renal insufficiency cannot always be diagnosed at necropsy.

Clinical picture of hepatic insufficiency. Usually the first 2 to 8 days after operation the course is uneventful: biliary drainage and urinary output are normal, fluids are taken well, the pulse and temperature are normal. One of the first signs of the onset of trouble is paling and thinning of the bile with marked increase in the flow. This profuse cholerrhagia does not continue long, but the bile remains thin. The patient begins to grow weaker, the pulse loses volume, and the temperature becomes subnormal. Restlessness and irritability develop with great fatigue and muscular weakness. Soon regurgitant vomiting follows intake of liquids by mouth, and little taken by rectum is retained. Jaundice does not deepen markedly, but there is an increasing pallor beneath the icteric hue, the face becomes drawn, and the eyes anxious. The patient grows progressively weaker and finally dies. The urinary output remains proportional to the fluid intake throughout, and the urine reveals little or no evidence of marked nephritis. The blood urea remains persistently low.

The histories of four cases are presented herewith in which there was a definite clinical picture of the lack of hepatic function.

Case 3. (A383124.) Mrs. G. B. B., age 61, presented herself at the Mayo Clinic for examination February 2, 1922. She had complained of attacks of epigastric pain for 45 years, more severe for the last 10 years. Four years before, the jaundice first appeared during such an attack. July, 1918, cholecystostomy was performed elsewhere; one large stone was removed. Attacks of nausea, vomiting, and jaundice persisted, and in December, 1920, cholecystectomy was performed elsewhere. Following this, fluctuating jaundice persisted, and clay stools, constipation, and general pruritis appeared.

Examination revealed jaundice. The systolic blood pressure was 144, the diastolic 84. The pulse

was 72, and temperature 98.5°. The patient weighed 101 pounds; her normal weight was 140 pounds. The hæmoglobin was 68 per cent, the erythrocytes numbered 4,090,000, the leucocytes 8,900. The specific gravity of the urine was 1.021, albumin 0, sugar 0, casts 0, erythrocytes 0, and pus 1 (scale of 1 to 4). Bile, urobilin and urobilinogen were present.

February 5, the patient was sent to the hospital and pre-operative preparation begun. The coagulation time was normal (4.5 minutes, Lee and White method), nevertheless 10 cubic centimeters of 10 per cent calcium chloride was given intravenously. The blood urea was 20 milligrams for each 100 cubic centimeters.

February 7, choledochostomy was performed for choledocholithiasis. The common duct was 2.5 centimeters in diameter. Two stones were removed. Local anæsthesia with whiffs of ether was used. Following operation the biliary drainage and urinary output were satisfactory, and the jaundice cleared slightly. On the fifth day bile ceased draining through the tube and there was only slight drainage around the tube. Aspiration and manipulation of the tube loosened the obstruction with restoration of drainage. On the seventh day the bile became thin and pale, but excessive in amount (1260+ cubic centimeters in 24 hours), the urinary output was 1590 cubic centimeters. Biliary drainage continued thin but gradually became reduced in amount. The blood urea on the eighth day was 34 milligrams for each 100 cubic centimeters. On the ninth day the urinary output became less and remained so. The urine contained a moderate amount of albumin and many hyaline casts. On the tenth day the leucocytes were 34,000. The patient grew restless, then drowsy, and became progressively weaker until she died on the fifteenth day. There was a slight sanguineous discharge from the wound the last 7 days.

Necropsy revealed a sinus passing down to the region of the common duct from which thick, purulent material exuded. There was no generalized peritonitis, very little gross hæmorrhage in the region of the wound, and none elsewhere. The heart and lungs were practically normal. The liver was small, weighing 985 grams, and its cut surface presented a brownish green mottling. The lobule markings were not distinct. The common and hepatic ducts were dilated. Microscopic examination revealed cells around the central veins shrunken in size, their shape irregular. In some lobules this condition extended out to the periphery. In the sinuses around the central vein was a moderate amount of brownish black pigment. The kidneys were atrophic, weighing together, 185 grams. Microscopic examination showed moderate, cloudy swelling, areas of rather marked interstitial fibrosis, and many hyalinized glomeruli and atrophied tubules. There was considerable bile pigment. Death was attributed to nephritis complicated by lack of hepatic function.

Case 4. (A381682.) Mrs. C. Z. W., age 40, presented herself for examination January 13, 1922, giving a history of recurring attacks of right upper abdominal pain without jaundice. Cholecystectomy had been performed elsewhere September 6, 1921. Shortly afterward jaundice developed, at first fluctuating, then persistently intense. The patient had lost considerably in weight.

The systolic blood pressure was 110, the diastolic 80. The pulse was 90. The hæmoglobin was 69 per cent, the erythrocytes numbered 4,490,000. The coagulation time was 8 minutes. The urine contained a moderate amount of albumin, and casts.

The pre-operative preparation was begun January 15; 31 cubic centimeters of calcium chloride was given intravenously in four doses. The coagulation time of the blood was reduced to 3 minutes.

January 19, a hepaticoduodenostomy was performed because of the absence of the common duct. Marked biliary cirrhosis and an atrophic liver were noted. The patient did not react well after the operation. On the third day, the jaundice seemed to deepen, and weakness progressed. On the second day, the pulse had risen to 110; on the morning of the fourth day it became increasingly weak and rapid and the patient remained in syncope for 3 minutes. Vomiting of "coffee" ground material occurred often. There was moderate oozing from the wound the third night. The temperature was 98° the second and third days, falling shortly before death. Aside from marked cardiovascular asthenia, the heart and lungs were negative. The urinary output was 240 cubic centimeters the first day, 510 cubic centimeters the second day, scanty the third day, and anuria developed the fourth day after operation. The urine contained a moderate amount of albumin but no casts. The blood urea before operation was 26 milligrams for each 100 cubic centimeters and the third day after operation, 68 milligrams. Death, which occurred on the fourth day, seemed to be due to general asthenia with insufficient hepatic function, complicated by moderate internal hæmorrhage.

Only an incomplete necropsy could be obtained. There was less than 480 cubic centimeters of blood in the abdomen. Microscopic examination of the liver revealed bile thrombi, atrophy of the liver cells around the central veins, and five granules of fat in the cells of the peripheral zone. Moderate fibrosis and lymphocytic infiltration occurred in the portal areas. The kidneys contained occasional sclerosed glomeruli and atrophic tubules with moderate swelling and granular change in the tubular epithelial cells. An excessive amount of bile pigment and many bile casts were present.

This is the only patient receiving pre-operative preparation with calcium who had serious postoperative bleeding, and in this instance the bleeding seemed only contributory. On the morning death occurred, the coagulation time was 21 minutes and the calcium time 12 minutes.

Case 5. (A377643.) Mr. E. G., age 57, presented himself for examination November 18, 1921. He had

TABLE I.—CASE 5.

Date	Bile drainage, c.cm.	Urinary output, c.cm.	Urine						Blood				Remarks
			Specific gravity	Albumin	Sugar	Casts	Pus	Bile	Hæmoglobin, per cent	Leucocytes	Urea, mg.	Creatinin, mg.	
11–22–21			1.022	1	Trace		1 to 3		78	5,000	17		
12– 1–21	980	880	1.016	2	0	1	1 to 4	+					Operation
12– 2–21	1600	970									28		
12– 3–21	1650	900											
12– 4–21	1780	770											
12– 5–21	960	800											
12– 6–21	1015	380	1.018	2	0			+			76	2.1	
12– 7–21	280	980											
12– 8–21	15	600	1.017	2	Trace			+					
12– 9–21													Death (9:15 a.m.)

been perfectly well until February, 1919, when he had an attack of influenza, followed by increased thirst and polyuria. The urine contained sugar. No treatment was given. The patient began to lose weight and strength. May, 1921, pain and tenderness developed in the upper abdomen, and, in June, a mass in the epigastrium was discovered. The mass disappeared and symptoms were relieved, except for slight pain and jaundice, which persisted. Six weeks before, jaundice had become more intense.

Examination revealed jaundice 2, pallor 1, and emaciation 1 to 2. The systolic blood pressure was 130, the diastolic 80; the pulse was 76. The patient's normal weight was 250 pounds; the present weight was 147 pounds. The specific gravity of the urine was 1.022; albumin 1, a trace of sugar, and pus were found. The hæmoglobin was 78 per cent. The erythrocytes numbered 3,980,000 and the leucocytes 5,000. The stools were clay colored and stercobilin was absent. The blood urea was 17 milligrams for each 100 cubic centimeters. The blood sugar was 0.21 milligrams. The coagulation time was 8 minutes.

The patient was sent to the hospital and received forced fluids and the diet for diabetic patients. The urinary output varied from 500 to 1600 cubic centimeters a day. The sugar disappeared from the urine. A transfusion was given of 500 cubic centimeters of citrated blood November 29, and the next day the coagulation time was 6 minutes.

December 1, 1921, cholecystostomy was performed. Pancreatitis 4, biliary cirrhosis 3, and a hard nodule of the head of the pancreas were noted. White bile exuded from the dilated common duct. A profuse drainage of thin, pale bile followed the operation. The patient grew progressively worse after the fourth day. Pulse and heart sounds became feeble, and muscular weakness increased. The patient became drowsy, indifferent, and irritably restless. The urinary output was satisfactory throughout and remained sugar free during his entire postoperative course. At no time was acetone present in the urine. On the seventh day, the patient complained of pain under the right ribs radiating to the right shoulder. The leucocytes numbered 25,000. The vomitus was coffee ground in type, and death occurred on the ninth day (Table I).

At necropsy the liver weighed 2550 grams, but showed marked central atrophy and hydropic change in the cells of the peripheral zones. The kidneys, together, weighed 413 grams and revealed only moderate signs of nephritis. There was carcinoma of the head of the pancreas, miliary gastric ulcers, right adhesive pleuritis, and old endocarditis; coronary sclerosis and purulent seminal vesiculitis were the only other important pathologic changes.

The liver appeared to have been responsible for the death of this patient. Many surgeons have called attention to the seriousness of finding white bile at operation (1, 2, 4). The discharge after operation contained some bile, but was chiefly seromucous.

In many instances in which the patients do not progress satisfactorily, there is undoubtedly a combination of insufficient renal and hepatic function. Either may dominate the picture and their relative importance may change. Case 6 is of interest in this regard.

CASE 6. (A379535.) Mr. T. S., age 64, presented himself for examination December 13, 1921. He had enjoyed excellent health until March, 1921, when he was taken ill with an attack of dizziness, weakness, and general malaise. In April, jaundice with clay-colored stools developed. His weight dropped from 235 pounds to 165 pounds in 3 months. The only pain was a dull ache in the posterior thoracic region

and in both shoulders. He improved gradually from July to November, the jaundice remaining faint. November 24, jaundice again became deep, accompanied by malaise, and loss of strength and weight. He passed from five to six frothy white stools a day.

Examination revealed intense jaundice, 3 to 4. The weight was 157 pounds, emaciation 2. The systolic blood pressure was 118, the diastolic 66. The pulse was 76. The urine contained a moderate amount of albumin and a few hyaline and granular casts. The hæmoglobin was 66 per cent; the erythrocytes numbered 10,900.

The patient was sent to the hospital for pre-operative preparation. The coagulation time of the blood was reduced from 7 to 3 minutes by intravenous injection of 25 cubic centimeters of 10 per cent calcium chloride solution in three doses. The blood urea before operation was 24 milligrams. December 20, 1921, choledochostomy for choledocholithiasis was performed. Marked biliary cirrhosis and subacute pancreatitis were noted. The gall-bladder was contracted and did not contain stones. Drainage was instituted.

The postoperative course was satisfactory until the fifth day when the patient experienced a sharp pain in the abdomen radiating to the right shoulder. This was followed by slight deepening of the jaundice and slight decrease in the flow of bile. The blood urea was 60 milligrams. For the next 6 days there were increasing signs of uræmia. On the eleventh day, the blood urea rose to 208 milligrams. The urine was loaded with hyaline and granular casts. The leucocyte count was 20,000. At the same time the blood showed a great quantity of bile macroscopically, and the coagulation time was 16 minutes. During the next few days the nephritis improved markedly. There was an excessive flow of very thin bile the twelfth and thirteenth days, and although the quantity was large the total amount of bile pigment seemed to be decreased. On the sixteenth day the blood urea was 128 milligrams and there were only a few casts in the urine. The blood contained less bile and the coagulation time was 8 minutes. Although the function of the kidneys seemed to be improving, the patient became worse about the twelfth day. Weakness increased. The pulse and respiration grew more feeble. The patient became restless and indifferent. The bile drainage remained very thin though less in amount. Death occurred on the nineteenth day after operation. The urinary output had remained satisfactory throughout.

Necropsy revealed the liver to be firm and shrunken, and weighing 1500 grams. There was a purulent discharge from the bile ducts. Microscopically, there were many bile thrombi in the capillaries of the central region; the hepatic cells were shrunken and distorted. There was moderate fibrosis of the portal areas with lymphocytic infiltration and a few polymorphonuclears. The combined weight of the kidneys was 325 grams. There were definite macroscopic and microscopic signs of nephritis.

Cumston, in a review of the conclusions of many French observers, Hélouin, Ramond, Géraudel, Sacquepée, Merklen, Lioust, and others, points out the fact that icterus may accompany acute nephritis with little or no manifestations of pathological conditions in the liver. Azotæmia is thought to be due to the renal insufficiency and to hyperfunction of the liver. In Case 6 the general picture was of clearing nephritis. The lowering of the blood urea was probably due to better elimination by the kidneys, and to diminished formation of urea, owing to lowered hepatic function.

Thus, the patient with obstructive jaundice dies from hæmorrhage, or renal or hepatic insufficiency. Hepatic insufficiency we believe differs from renal insufficiency; associated with the former there is abundant drainage of light colored bile, containing small amounts of the bile pigments. Patients become restless, then drowsy and stuporous, and finally succumb. During the entire course of the hepatic insufficiency little change occurs in content or volume of the urine, and the blood urea remains persistently low. Renal insufficiency is associated with the cessation of drainage of bile. But with the cessation of drainage, evidence is shown in the urine from day to day of a progressing nephritis, and the anæmia may increase in the last stages. During this period of renal insufficiency secondary to the damming back of the bile in the circulation, the jaundice deepens, the coagulation time of the blood lengthens, and the blood urea progressively ascends to the level of uræmia.

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SYPHILIS OF THE UTERUS

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IN the various textbooks on medicine and surgery, as well as in the more specialized books on syphilis, much attention has been given to the cutaneous, cerebral, and osseus changes which occur as a result of syphilis, but until comparatively recently, little has been said of the visceral changes, or little of the thoracic and abdominal and pelvic viscera as affected by this common disease.

Within the past few years more attention has been directed to the thoracic, abdominal, and pelvic viscera and it is now rather well known that a large percentage of so-called tuberculous lungs are syphilitic; that many liver and metabolic disorders are syphilitic, that frequently so-called gastric carcinoma or duodenal ulcer is syphilitic, and that many cases of gastric or intestinal mal-digestion are due to disturbed arterial function—and that syphilis is not infrequently a factor in producing this. It has been less commonly recognized that more than occasionally fibrosis of the kidney, i.e., interstitial nephritis is of syphilitic origin; and only very rarely that there are a considerable number of cases in which the uterus is the organ which shows the main pathology in spirochætal infections. When, about 1907, I began to look in the textbooks for some reference to this condition, I found in one volume a brief note to the effect that syphilis may affect the uterus.

From 1905 to 1914 I had charge of the gynecological clinic at Shirras Dispensary in Charleston, S. C., and during that time saw approximately 2000 cases (2165). As a number of these were "repeat" cases extending over 2 or 3 years, I may reduce this number by, say, 500, and consider that I have attended about 1500 women during that time. A trifle over 1 per cent of these were white, the remainder negroes.

Patients with all sorts of diseases and conditions appeared at the clinic, but only a small proportion were true gynecological cases. However, by 1907 I began to realize that in a certain number of cases there was a pretty constant complex of uterine or pelvic symptoms and that, if observed closely, this complex usually accompanied evidences of syphilis elsewhere. Wassermann tests were unavailable at a charity clinic at that time and for diagnosis I had to rely upon observation, history (usually faulty and sometimes purposely false), physical examinations, and finally the therapeutic test. In consequence of this my figures are approximate and are open to criticism. Moreover, I am quoting largely from memory, as my connection with this clinic was severed in 1914. I was able recently to obtain access to the record book of visits, but the diagnoses were not complete and I have to give approximate figures.

To the best of my recollection I had accumulated 87 cases which I believed were clearly cases of syphilis of the uterus. I had hoped to get 100 cases before writing an account of my observations, but I was not able to do this before leaving the clinic. Nothing further was done with my observations until about a year ago when I asked Dr. John Clarke of Philadelphia, if he would give me the result of his observation in this connection. He promised to have his clinic take the matter under study and I understand he has accumulated considerable data already.

When I speak of syphilis of the uterus I do not mean to classify a disease limited to one organ nor to describe cases where the whole pathology is limited to the uterus—such cases, in my opinion, do not exist. But I aim to direct attention to syphilitic affections which produce marked change in the uterus and its adnexa, and which give a group of symptoms usually ascribed to other causes; in other words, I mean to discuss uterine changes due to syphilis.

As to the etiology of syphilis, of course all of us know it so well that no discussion need be given. As to the predisposing factors which might cause a uterine predilection for syphilitic changes, all of us should know, but many of us are forgetful of the fact that any vascular organ, especially one where the circula-

tion is variable, is apt to be a sufferer from these changes, consequently the brain, the spinal cord, the lungs, the liver, the kidneys, the bones and the uterus are all apt to suffer. When we consider the pathology of the disease, we can readily understand the reason.

The essential pathology of all syphilitic changes is an endarteritis and a peri-arteritis —probably toxic in nature—the spirochætal toxin seeming to be a stimulant to cell prolification, especially to round-cell infiltration and organization. It seems to be somewhat of a paralyzant of vascular tonus producing in its early manifestations local and general hyperæmias and later thickening of vascular walls, especially of the arteries. From this essential pathology the entire question of the pathology and the symptomatology of syphilis might be worked out without error. As to the special uterine pathology we may take up its progress step by step.

1. *The initial sore.* This *may* be on the cervix uteri or may be anywhere else—is usually elsewhere. But should it be on the cervix we find the cervix large, soft, congested, usually one lip more enlarged than the other. Generally there is an ulcer which is surrounded by a bluish areola or by a deeply inflamed border. The surface of this ulcer is nearly always covered with a dirty looking membrane, though it may be fairly clean looking. The ulcer feels as if it were on a thickened base rather than on a punched-out area. There is usually some leucorrhœa—most often of a sero-sanguineous character. When the ulcer heals there is generally evidence of scar or cicatrix at its site. But description of cervical chancres can be found in almost any textbook on gynecology.

Regardless of where the initial sore is, the changes occurring later may be the same. Following on the heels of the chancre, or at a variable length of time after it, commence the toxic changes. Just as we find the pharyngitis, gastritis, enteritis, and skin rashes, so we find the uterine body and mucosa evidencing changes. In this stage the uterus is commonly heavier than normal and the endometrium congested—evidenced by leucorrhœa, menorrhagia, and pelvic discomfort. So far no real changes have occurred—only a passive congestion from a toxic vascular dilatation.

Following this stage the tissues seem to become more or less accustomed to the toxins and then follows a period of quiescence. However, the spirochætæ continue to increase, and after a while the particular organ most susceptible to the toxins begins to react. Should it be the uterus we find that the organ commences to increase in size, the cervix to become softer and more juicy, the uterus to feel heavy and softer than normal, and the size finally to reach from 1½ to 3 times the normal. During this stage the organ is passively congested. There is decided cell proliferation extravascularly, and some intravascularly. Occasionally there is peri-uterine inflammation with cobwebby adhesions to other structures; but in a greater proportion of cases there is not, and the uterus is movable, but with difficulty, owing to its increase in size and weight. Retroflexion, pressure on the rectum, and interference with the circulation of the ovaries may result from the same cause. This stage I have called the hyperplastic stage, or wet uterus.

With organization of the new-formed cells a steady change to the next stage follows. As organization occurs and as the endarteritis accompanies the peri-arterial infiltration, we find the new-formed fibrous tissue shrinking and the uterus becoming more dense, less juicy and smaller. Steadily the contraction occurs until finally the uterus is from two-thirds to even one-half the normal size, is freely movable, hard, dense, fibrous in feel, cervix, small and firm, and mucosa thin, pale and ill-nourished. I would expect to find small areas of vessels caught by the constriction and full of blood in the removed uterus, i.e., small punctate hæmorrhages. These I have not noticed. The uterus in such cases is usually rather insensitive, easily outlined on palpation, and freely movable. Should the hyperplastic stage have been intense, however, adhesion might have fixed it more or less—commonly less. This stage I have classified as the hypoplastic stage or dry uterus. The proportion of cases seen in the hyperplastic to those seen in the hypoplastic stage I have observed to be about one

to four or five. This is to be expected. As earlier recognition and treatment of such cases advance, the proportion will naturally change.

Considering the pathology, the symptomatology is rather obvious. The general symptoms are commonly known. The uterine symptoms are often ascribed to other causes.

In the initial stage with cervical chancre, of course there is leucorrhœa of a sero-sanguineous, or of a sanguino-purulent character, if there is a mixed infection. The discharge often has a disagreeable acrid odor which does not persist very long on the guards after exposure to air. There may be some pain and feeling of heat in the pelvis and often backache. Examination with speculum or gloved finger usually discloses the ulcer described above. When mixed infection with pyogenic organisms occurs, broad ligament or tubal infection may follow with their chain of symptoms. The leucorrhœa of the initial stage may persist into the stage of secondaries or may subside during the quiescent stages. Accompanying the stage of the secondary or toxic symptoms, the uterine symptoms are often lost sight of in the maze of other troubles. With the eruption, the pharyngitis, the diarrhœa and the fever which often mark the so-called secondaries, or the toxic stage, the pain in the back, heaviness in pelvis, menorrhagia, metorrhagia, leucorrhœa and other symptoms of pelvic congestion are overlooked, but they are often there. Owing to the congestion of the uterus, symptoms of pressure on bladder and rectum are complained of, with tenderness of the uterus on palpation, and of the ovaries on pressure. The menstrual period is prolonged and the flow increased in amount, metorrhagia is common and leucorrhœa the rule—being usually serosanguineous, infrequently purulent. This usually subsides with the passage of the toxic stage, but not completely as a rule, a thin discharge being left. The onset of this stage is often rather rapid or even sudden and the ending by lysis.

In the quiescent stage there is usually little to note. The uterus is apt to be still somewhat engorged and to present the expected symptoms of this engorgement.

The onset of the next stage—that of hyperplasia, is gradual. The patient cannot usually fix the time of the first symptoms. There is a gradual increase in feeling of weight and pressure in the pelvis. The pressure in the rectum gradually increases and often produces constipation. The uterus, through its increase in weight is usually retroflexed, thus giving the common symptoms of retroflexion and of interference with ovarian circulation, i.e. pain in back, nervousness, etc.; sometimes nausea resembling the morning sickness of pregnancy, occurs, and misleads the examiner, especially in view of the enlargement of the uterus. If there is great engorgement, pressure on the bladder may cause frequent desire to micturate. A serosanguineous leucorrhœa is common. Menorrhagia, both as to time and quantity, is the rule, sometimes metorrhagia. The uterus is movable by the examining finger, but with difficulty on account of both its weight and its sensitiveness; the fundus is soft, juicy and generally more pear-shaped than globular. It feels boggy rather than like a cyst full of fluid. The cervix is soft though usually not so much so as in pregnancy. In this stage the abdominal walls are, as a rule, not so thin as later on and consequently the uterus, though larger, is not so easy to outline as in the hypoplastic stage. The vaginal mucosa looks more moist than usual and may be congested. Mucous patches may be in evidence. The outer genitals usually look congested and feel warm. The bluish tint of a pregnancy may be simulated, though this is not the rule. Often there is some injection of other mucous surfaces, especially of the pharynx and conjunctiva and of course discrete glandular enlargement is the rule.

As this stage passes into the final or dry stage the change is almost imperceptible. There is a gradual reduction of the pelvic symptoms. The backache is diminished; the pressure symptoms on rectum, bladder and ovaries pass. The menorrhagia ceases and the flow becomes more and more scant and less painful until frequently it is only of one day's duration or less and of a thin bloody or blood-tinged leucorrhœa. The metorrhagia disappears. The leucorrhœa becomes

thin and glairy and occasional. The introitus looks paler than normal and thinner, the vaginal mucosa looks paler and more fibrous than normal. The cervix is smaller and harder than normal, sometimes scarred. The uterus is usually in the normal anteflexed position, is small, hard, fibrous, and generally freely movable. Sexual desire is usually diminished. As there is commonly a marked diminution of surface fat in cases advanced thus far, palpation of the uterus is usually easy. Also the diminution in sensitiveness of both uterus and vagina in this stage render vaginal examination easier.

I have noticed that in a considerable percentage of these cases the skin assumes a rather characteristic appearance—a lack of normal elasticity and smoothness as it were, and at the same time the conjunctivæ seem paler than normal, but lose their clear transparent look and seem somewhat frosted. This appearance is hard to describe but easy to recognize. The glandular system, of course, presents the usual evidence of syphilis. Other organs may add their quota of symptoms at any stage of the disease—these symptoms we will not enumerate for lack of time.

A symptom I have not yet brought out is that of habitual abortion. Pregnancy complicated by syphilis is especially prone to end prematurely as is well known—when we consider the pathology of the syphilitic uterus it is easy to understand why this should be so. As a uterus passes through the wet stage it is less and less apt to retain a fœtus, and in the dry stage it is almost impossible for a fecundated ovum to find lodgment or nourishment in the fibrous-walled and membrane-thined organ. I presume we could call an abortion a complication of syphilis, but I think it would be more exact to class a pregnancy as a complication and an abortion as the natural result. Other complications as adhesion, pyosalpynx, etc., may occur. On opening the abdomen of the syphilitic it is not rare to see cobwebby adhesions not only around the uterus, but between the intestines.

The so-called tertiary syphilitic affections of the uterus may in some cases be mistaken for carcinomata, and treated as such. Some of the remarkable recoveries after operation on extensive, apparently malignant, growths may be accounted for by this.

The diagnosis of syphilis is not always easy. Even with the common use of the Wassermann test our results are not 100 per cent correct. Sometimes we get negative Wassermann reactions in cases undoubtedly luetic and sometimes we get positive support from the laboratory only after provocative doses of potassium iodide or of arsphenamin. In reaching a diagnosis in our gynecological cases it is well to bear in mind that syphilis is a factor to be reckoned with.

Though the majority of my cases were between the ages of 19 and 23 yet the ages ran from 14 to 39 or older, so age does not exclude syphilis, nor does youth. Given, however, a combination of uterine symptoms with other evidences of syphilis, it is wise to try antisyphilitic treatment before operative measures of any sort are instituted.

A STUDY OF THE MATERNAL DEATHS AMONG TEN THOUSAND PARTURIENT WOMEN AT THE CHICAGO LYING-IN HOSPITAL[1]

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A STUDY was made of the last 10,000 parturient women admitted to the Chicago Lying-in Hospital and Dispensary with a view of analyzing the maternal deaths. These patients were admitted from November 1, 1914, to October 1, 1921, and during this time there were 39 deaths. This gives, therefore, a gross mortality of 0.39 per cent. The hospital is an open one and over three hundred different doctors send patients to it.

The age of the 39 patients varied from 18 to 42 years. Twenty patients were primiparæ and 19 were multiparæ.

The duration of the patients' stay in the hospital was as follows:

	Cases
Less than one day	3
One day	8
Two days	8
Three to ten days	11
Eleven to twenty days	6
More than twenty days	3
	39

Among the 39 patients, 26 babies (one twin) were born alive while 15 babies (one twin) were stillborn. However, at the time the mothers died, only 22 children were alive.

Of the 39 patients, 8 had been delivered in their homes before having been sent to the hospital. Five of these were delivered by our out-patient service while a sixth precipitated before the interne reached her home. The remaining two patients were delivered by an outside physician and a midwife respectively. Of the remaining 31 patients, 7 were ward patients, the rest being under the care of private physicians. Furthermore, of the 31 women delivered in the hospital, 6 had been examined vaginally in their homes by physicians or midwives.

Accepting Osler's statement that the normal oral temperature is rarely above 99.2°, we find that among the patients whose temperatures were recorded on admission, but 45 per cent had normal temperatures.

The manner in which these fatal cases were delivered was as follows:

	Cases	
Spontaneous delivery		17
Spontaneous delivery after induction of labor with colpeurynter		1
Low forceps		7
Mid-forceps		4
Version and extraction		1
Forceps attempted, then version and extraction		1
Cæsarean section		7
Classic	6	
Kroenig	1	
Abdominal hysterectomy		2
Vaginal hysterotomy		1
		41 (two pairs of twins).

Two of the patients who delivered spontaneously, gave birth before the doctor reached them. Of the women who were delivered by mid-forceps, one died as the forceps were being applied. The stillborn child was extracted after maternal exitus and no rupture of the uterus or vagina was found postmortem. Another of the mid-forceps operations was performed by a midwife at the patient's home and the result was a ruptured uterus and a third degree laceration.

For the 7 patients who had cæsarean sections performed, the cause of death was as follows:

	Cases
Peritonitis	3 (2 Classic, 1 Kroenig)
Shock (from abruptio placentæ)	1 (Classic)
Eclampsia	1 (Classic)
Toxæmia	2 (Classic)

The two cæsarean sections for the patients with "toxæmia" were performed under local anæsthesia (novocaine). Of the three patients who died of peritonitis, two had been examined vaginally before operation.

The cause of death for the 39 patients was as follows:

1. Puerperal sepsis		6 (One autopsy)
2. Peritonitis		6 (Two autopsies)
3. Shock		6 (One autopsy)
a. Ruptured uterus	3	
b. Hæmorrhage	3	

[1]Abstract read before the Chicago Gynecological Society, January 13, 1922.

4.	Eclampsia	5	
5.	Embolism	4	(One autopsy)
6.	Pneumonia	4	
	a. Influenzal	2	
	b. Lobar	1	
	c. Broncho	1	
7.	Cardiac decompensation	3	
8.	Toxæmia	3	(One autopsy)
9.	Coronary thrombosis	1	(Autopsy)
10.	Status lymphaticus with pulmonary œdema	1	(Autopsy)
		39	(Eight autopsies)

PUERPERAL SEPSIS

Three of the six patients who died of puerperal sepsis were delivered before admission to the hospital. Two were delivered by the dispensary internes and these patients had easy spontaneous labors. One patient had had sexual intercourse 2 days before delivery. In neither of these 2 women had a vaginal examination been made. The third patient who gave birth before admission, delivered spontaneously a premature baby in transverse position. Cultures from the blood of the baby's heart showed gas bacilli. This patient's temperature during labor was 101.5°. Her history stated that she had had puerperal infection one and a half years previously.

Of the remaining three patients dying of puerperal sepsis, namely those delivered in the hospital, one had been examined vaginally before admission without gloves and the patient's temperature when she entered the hospital was 100.8°. The membranes had ruptured 46 hours previously and there was a foul odor to the liquor amnii. The placenta which was very adherent had to be removed manually. The second patient delivered in the hospital who died of child-bed fever, was admitted with that diagnosis, her temperature being 100.6°, her pulse 136, and her respirations 50 to the minute. Immediately after delivery her temperature was 104°. The latter two patients were delivered with low forceps. The third woman who gave birth in the hospital, delivered herself spontaneously of twins and the placenta. Eleven days postpartum she had a severe hæmorrhage which necessitated curettage and tamponade of the uterus. Placental tissue was removed at this time, and the patient died of sepsis on the fortieth day after delivery. At autopsy, the uterus appeared normal but abscesses in both lungs were found.

Of the six patients dying of sepsis, the placenta was removed manually in two. Four babies (one twin) were born alive while three were stillborn. All the patients but one had a temperature above 100.5° on admission to the hospital.

PERITONITIS

Among the six deaths from peritonitis, three followed cæsarean section, one an abdominal hysterectomy for ruptured uterus, the fifth one resulted from a ruptured appendix, and the sixth was associated with perforations of the small intestine. For those who died after cæsarean section two different types of operation had been performed; namely, classic (2) and Kroenig (1). As was stated above, two of the three cæsareanized patients had vaginal examinations before operation.

The patient on whom the Kroenig operation was performed was a woman weighing 278 pounds, whose blood pressure was 202–120, who had œdema of the legs and abdominal wall and albumin in the urine. She was two weeks overdue (the child weighed 3963 grams) and had been in labor 83 hours before the operation was performed. During the operation the bladder was accidentally perforated. The patient died 4 days later.

The patient who died of peritonitis three days after the abdominal hysterectomy was a multipara, who was brought to the hospital after her uterus had ruptured at home 5½ hours after the beginning of the second stage of labor. Her temperature on admission was 103°.

In one of the women on whom a classic cæsarean section was performed, the abdominal wound separated all the way, before death, which occurred on the eighth day postoperative. Autopsy revealed peritonitis due to the staphylococcus aureus. The second patient who had a classic cæsarean section, like the former, died of peritonitis on the eighth day after operation, although she had also presumably been a "clean" case. Autopsy revealed pus in the uterine cavity and a very dark, necrotic-looking vagina. The infection

had evidently been an ascending one from the vagina.

The patient who died of peritonitis following a ruptured appendix, had had a spontaneous delivery at home 4 days before admission. Laparotomy under local anæsthesia revealed free pus in the abdominal cavity.

The patient who died from perforations of the small intestine, had a spontaneous delivery; but the day after delivery, her abdomen became markedly distended. The customary treatment was of no avail, and when a laparotomy was performed 8 days postpartum, much gas escaped from the abdominal cavity and perforations in the small intestine were found. The patient died the following day.

SHOCK

As was stated above, three patients died from shock caused by hæmorrhage and three died as the result of ruptured uteri. Of the patients who died from hæmorrhage one had an abruptio placentæ. She was admitted in a condition of shock, almost *in extremis*. A cæsarean section was immediately performed and a blood transfusion started soon after the incision was made, but the patient died on the table. A second patient who died of hæmorrhage was an elderly primipara who had a temperature of 101.2° during labor and who was delivered of stillborn twins by low forceps and version and extraction respectively. Because of bleeding, the placenta was removed manually and the uterus packed with gauze. There was profuse bleeding from the episiotomy wound as well as from the uterus, and the patient died on the delivery table. The third patient who lost her life because of hæmorrhage, had a spontaneous delivery and the estimated loss of blood was 1700 cubic centimeters. The uterus was examined postmortem and found to be intact.

On one of the three patients with ruptured uteri who died of shock, an abdominal hysterectomy was performed. In this case there was a rupture of one horn of a bicornuate uterus. The second patient who died of shock from a ruptured uterus was delivered with forceps by a midwife who not only ruptured the uterus but also tore the sphincter ani muscle. The third patient whose uterus was ruptured was delivered in the hospital. The accident occurred during a version after a forceps delivery had been unsuccessfully attempted, the patient having been in labor 51 hours. The latter two patients died shortly after the rupture occurred before an operation could be performed.

Of the four patients with ruptured uteri therefore, three died of shock while the fourth died of peritonitis following operation. In three of the cases the rupture occurred outside the hospital. On two, abdominal hysterectomy was performed, while two died before treatment could be instituted. The cause of uterine rupture for one case was forceps; for another, version; for a third, a long second stage. For the fourth the cause was unknown, the rupture having occurred outside the hospital and no definite information was obtainable.

ECLAMPSIA

Five patients died of eclampsia. Since there were during this period of time 46 patients with eclampsia the maternal mortality for this condition at the Chicago Lying-in Hospital and Dispensary was 10.9 per cent.

Two women who died had intrapartum and three had postpartum convulsions. All the patients had albumin and casts in their urine and the blood pressures ranged from 160 to 190, systolic, and from 82 to 110, diastolic. Strange to say, the number of convulsions varied inversely as the blood pressure. Thus:

	Blood pressure	Number of convulsions
Case 1	160– ?	16
Case 2	160– 86	11
Case 3	165– 82	9
Case 4	185–120	8
Case 5	190– 90	1

The first two patients listed above had spontaneous deliveries and developed convulsions postpartum. The first one was delivered at home and had fourteen convulsions before admission. The third woman was delivered by low forceps. A classic cæsarean section was performed on the fourth eclamptic because of her toxæmic symptoms, and she developed convulsions after delivery. The

last patient delivered a premature fœtus (780 grams) spontaneously after labor had been induced with a colpeurynter. The second patient had a mitral stenosis and insufficiency.

Venesection was performed on four of the five women and on one a spinal puncture was also done. Four babies were born alive, while the fifth was a still-born premature fœtus (780 grams). The live babies were small (2718, 2780, 2785, and the fourth unknown), and all were alive at the time their mothers died, which occurred on the first, second (two patients), third, and ninth days postpartum. The patient who had been delivered at home, was the wife of a man who subsequently married the former's sister and the latter also developed eclampsia but it was not fatal.

EMBOLISM

Two of the four patients whose deaths were attributable to embolism were up and about twelve and fourteen days respectively after delivery by low forceps. One had had a temperature of 102° for several days and one had manifestations of kidney disease. Both died suddenly, showing symptoms of embolism. A postmortem examination was made on one of these women and a large embolus was found occluding the tricuspid orifice. The embolus had its origin in a thrombus situated in the vena cava inferior and the latter in turn was an extension of a large thrombus which took origin in the left hypogastric vein.

The third patient passed away before delivery, while forceps were in place preparatory to the extraction of the child. Delivery was effected immediately after death but the baby was dead. Examination of the uterus revealed no rupture.

The fourth patient entered the hospital with an abruptio placentæ and because the bleeding had ceased, the cervix partially dilated, and uterine contractions were present, a Voorhees colpeurynter was inserted and a Spanish windlass applied to the abdomen. The colpeurynter was soon expelled and a stillborn fœtus and large clots of blood followed. The placenta was immediately expressed with great ease. The amount of blood lost was estimated at 1000 cubic centimeters. The patient left the delivery room in good condition. All through the puerperium there was a slight rise in temperature and during the last 8 days the pulse ranged between 118 and 124. She died on the twenty-second day postpartum.

In all the cases but one, the placenta was delivered by "early expression"; that is, slight pressure was made on the contracted uterus after the placenta had separated completely and was lying either in the lower uterine segment or in the vagina. In the fourth case (the patient who died on the table), the placenta was removed manually after death.

Of the four patients, three had had anæsthesia (ether) and three had been examined vaginally. Three were delivered by forceps while the fourth had a spontaneous delivery after induction of labor by means of a colpeurynter.

PNEUMONIA

The two patients who died of influenzal pneumonia, were admitted with the affection. The first entered the hospital with the fœtal head on the perineum and delivered spontaneously shortly after admission. The child, which was premature (1719 grams), was stillborn. The second woman had delivered spontaneously at home before the dispensary interne reached her. The entire labor had lasted 4 hours and 35 minutes, and the child was in good condition. The following day the patient was admitted to the hospital with a temperature of 104.2°. She died 2 days later of pneumonia.

The parturient woman who died of lobar pneumonia was a primipara who had a spontaneous delivery of a live child after a 22-hour labor. She was given only a few whiffs of ether. The day following delivery, pneumonia developed, and the patient succumbed to the disease 10 days later.

The fourth patient in this group was a dispensary patient who had had a spontaneous delivery, without anæsthesia, at home. She was admitted to the hospital the day after delivery with a temperature of 102.4°, and signs of bronchopneumonia. She died 2 days later.

CARDIAC DECOMPENSATION

Of the three patients who died of this complication, one was admitted in a state of decompensation, while in a second, decompensation began during labor, which was prolonged (63 hours). The entire duration of labor for the first patient was exactly 4 hours. Both women had mitral stenosis and insufficiency and in both, labor was spontaneous. Delivery in the third patient was accomplished by low forceps after a 17-hour labor, and death occurred 3 hours later in the presence of symptoms and signs of cardiac decompensation. Two patients were primiparæ, while the third was a sextipara. Two patients died on the day of delivery while the third passed away the day after delivery.

TOXÆMIA

All three patients who died of toxæmia entered the hospital with outspoken symptoms of the condition. In one parturient the toxæmia was possibly of infectious origin. Two or three weeks before delivery, this patient contracted a cold and soon thereafter began to have delusions. She was admitted to the hospital because of her insanity and on entrance had a temperature of 100°, pulse 136, jaundice, blood pressure 115–65, and albumin and casts in the urine. She was 6½ months pregnant. Dr. Archibald Church, who saw the patient in consultation, made a diagnosis of toxic delirium and advised induction of labor. The membranes were ruptured and the cervix packed with gauze. This being ineffectual, a vaginal hysterotomy was performed without any difficulty. The placenta showed staphylococci in pure culture. The delirium ceased and the temperature, which was 103° at the time of operation, dropped. However, on the nineteenth day, just as the patient appeared to be entirely well, she died suddenly of what seemed to be an embolus.

One other patient had jaundice before delivery while the third developed icterus and also delirium the day after operation. All three patients had albumin and casts in the urine, but not one had convulsions. One patient had coffee-ground vomitus and a tender liver. Two women were in the seventh month of pregnancy. The third was near term but her baby weighed only 2748 grams (6 pounds). The latter had convulsions and was transfused. However, it died during a convulsion on the fourth day, which was the day of its mother's exitus. The other two fœtus, which were premature (1190 and 1219 grams), were stillborn. As regards treatment, a vaginal hysterotomy was done in one case while in the two remaining patients, a classic cæsarean section was performed under novocaine anæsthesia. In these women, the liver was small, of a yellow tinge, and looked like a liver in the first stage of acute yellow atrophy. The patients died on fourth, sixth, and nineteenth days after operation. An autopsy on one woman disclosed no local infection.

CORONARY THROMBOSIS

The patient with this condition like the other patients with cardiac disease, had a mitral stenosis and regurgitation. She was a primipara and her labor, which lasted a little more than 5 hours, was terminated with mid-forceps. She died on the ninth day postpartum and autopsy revealed a coronary thrombosis.

STATUS LYMPHATICUS

An 18-year old primipara was delivered by mid-forceps after a 25-hour labor. An episiotomy had been performed and because of hæmorrhage, the placenta was removed manually. The patient died suddenly while the episiotomy wound was being repaired. An autopsy was performed and the thymus and mesenteric glands were found to be enlarged. Pulmonary œdema was also present.

A REPORT OF FIVE UNUSUAL CASES OF HYPERTENSION IN PREGNANCY

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An increase of blood pressure in a pregnant woman is commonly the most ominous sign of impending toxæmia and always causes the obstetrician concern from the moment the disturbance is noted until the patient has been delivered. Starling (1) remarked that any systolic pressure of 125 in pregnancy would make him feel that the pregnancy was not quite normal and would put him on the lookout for some degree of toxæmia. It goes without saying that a high blood pressure in pregnancy carries with it more danger than in the non-pregnant state. Ringer (2) considers every case of hypertension a potential nephritic. Irving (3) in a study of five thousand pregnancies reports that 80 percent of the cases had a systolic pressure not exceeding 130. It is probably fair to assert that a systolic pressure of 150 or more in pregnancy should be considered pathological in the majority of patients. Weber (4) suggests that a constant systolic pressure of 160 or more is the dividing line and pathological limit. It cannot be forgotten, however, as Faught (5) has demonstrated that some women show a persistent high blood pressure and at no time present a picture of toxæmia. Such cases are to be observed carefully, but they do not fall under the class necessitating surgical interference, and they are to be distinguished from the pregnant cases showing even a moderately high blood pressure accompanied by all or some of the familiar signs of toxæmia.

The five cases reported are presented because all occurred in pregnant women under 30 years of age, with a minimum systolic pressure of 180 to 240 prenatally, and a pressure of 170 to 240 postpartum. The various results of the blood examinations and functional tests seem quite out of harmony with the degree of hypertension.

Case 1. Mrs. S., 28 years old, was in her second pregnancy, and at the beginning of her sixth month. She is said to have had severe pyelitis during her first pregnancy. Her present pregnancy has been uneventful and she delivered speedily and normally. Her convalescence was uneventful.

Case 2. Mrs. W., 27 years old, was in her fifth pregnancy at the beginning of the seventh month. She was said to have suffered from pyelitis and cystitis in preceding pregnancies. She went through an apparently normal pregnancy and delivered easily after a rapid labor. Her convalescence was negative.

Case 3. Mrs. B., 28 years old, was in her fifth pregnancy and at the beginning of her sixth month. Her pregnancy was uneventful excepting during the four weeks previous to delivery when she was irritable and subject to frequent headaches. There seemed to be a definite relationship between this disturbance and constipation because brisk catharsis relieved the trouble promptly. She had a long, slow labor and was delivered easily with forceps at full dilatation because of delayed second stage. Her convalescence was uneventful.

Case 4. Mrs. R., a primipara, 28 years old, was seen for the first time at the beginning of her sixth month. During pregnancy she was easily worried and inclined to become hysterical at the slightest provocation. She complained occasionally of headaches and dizziness but was otherwise well. After a moderately severe labor she was delivered with low forceps because of fœtal distress. Her convalescence was not remarkable. This woman had a family history of hypertension and in addition had definitely infected tonsils.

Case 5. Mrs. M., 23 years old, and in her second pregnancy, was first seen when about 6 weeks pregnant and had come for examination at this early date because her first pregnancy had terminated in a miscarriage at 4 months. From the beginning, she complained bitterly of nausea and vomiting together with right-sided headaches, which she said made her "blind." Rest in bed with high carbohydrate feeding and sufficient catharsis practically relieved her of all symptoms. She aborted at the end of 4 months. Her stay in the hospital was uneventful.

This patient gave a history of frequent attacks of tonsillitis until a tonsillectomy had been done 2 years previous. There was enough physical evidence to suggest a diagnosis of mitral stenosis.

Of the cases seen at the end of 3 months postpartum, the first three patients seemed perfectly well and were living normal lives. Patient number five dropped dead the day after she was seen for final visit, the cause of death apparently being coronary embolism. Patient number four entered the hospital when her baby was 4 months old. She

gave a history of a severe nervous shock on the morning before entrance. A severe headache came on followed almost immediately by a generalized convulsion. Venesection was performed by the physician summoned and some time later she was removed to the hospital. She complained bitterly of pain in her neck and also of occipital headache. Her vision in the left eye was obscured by a massive retinal hæmorrhage covering the disc and the vision in her right eye was disturbed from a similar cause. At this time her blood pressure was 130–80. The urine was negative except for the slightest possible trace of albumin. Lumbar puncture revealed a bloody fluid under pressure but otherwise negative. The blood was considered to be in the spinal fluid and not a result of faulty technique. Her headache was immediately relieved after the puncture. The patient seemed to be suffering from a definite vascular crisis of the cerebral type and in the course of a few days developed some paralysis of the right hand and foot, a definite speech disturbance together with a mental upset. She could be considered a case of cerebral apoplexy with the final result still in question.

The first three patients were approximately 5 feet 8 inches tall and weighed between 150 and 160 pounds. Patient four was 5 feet 2 inches tall, weighing 160 pounds, shortnecked and plethoric. This particular woman would worry over the merest detail and was easily disturbed by unimportant detail. The fifth patient was 5 feet 9 inches tall, thin almost to the point of emaciation. Moschcowitz (6) remarks that the "type" individual is commonly overweight, shortnecked, unathletic; that she is physically prematurely old and lacks the ability to play either mentally or physically. According to this description patient four is the only typical case in the series.

The physical examinations in the first three cases were negative. The last two patients had markedly thickened arteries with a definite leathery feel to the palpating finger, and this in spite of the fact that roentgenographs showed no marked sclerotic changes in the vessels. Case 4 had a definite cardiac hypertrophy and Case 5 presented evidence suggesting mitral stenosis.

All patients were given the same prenatal care, advised to drink ten or more glasses of water daily, to rest morning and afternoon, lying down for at least an hour, and to avoid strenuous exercise. The diet was restricted comparatively little with the exception that meat, fish, and eggs were allowed only once daily. Extra salt and the use of condiments were forbidden and a high carbohydrate diet urged. The blood pressures were taken every fifth day and the times of reading the pressure were different to note whether the time of day made any difference or not. The urine was examined every third day. For a laxative, fluid extract of cascara was recommended, one half drachm twice daily, and in every case it was effective. At delivery the placentæ showed no gross changes indicative of either a nephritis or any toxæmia.

The Wassermann in each case was negative.

The age incidence in this series is rather remarkable.

Woley (7) gives the normal range of blood pressure between the ages of 15 and 30 as 103 systolic, to 140 with an average reading of 122 millimeters of mercury. Janeway (8) found 80 to 90 percent of all patients with hypertension to be between the ages of 40 and 69. Weber (9) says that for insurance purposes he considers every person who may at any one examination have a systolic pressure of 200 or over, as far as life assurance is concerned, as an applicant of 70 years, although, as a matter of fact, he may be well under 50.

The physical makeup of the patients was atypical with the possible exception of Case 4. None of the patients was overweight and none was of apparently nervous temperament. All were seemingly in the best of health enjoying life, and would never have consulted a doctor were it not for the fact of pregnancy. All were happily married and had no particular worries, either economic or otherwise. The blood pressures were taken with a mercury column using the auscultatory method. The readings were made at different times to attempt to discover an essential variation. All postpartum figures and tests were made at least 3 months after delivery. All the patients were put to bed for a five-day rest and in not a single instance did the pressure diminish, indeed in Case 5 there was a rise to 250, despite the fact that the patient was content and quite willing to stay in bed. Case 4 showed a drop in pressure to 135-70 after delivery but there

was a gradual increase until the fifth day postpartum when the pressure was back to its original figure. The other four cases showed no marked change following delivery, the figures remaining practically stationary.

TABLE I.—Blood Chemistry

Case	1		2		3		4		5	
Para	II		V		V		I		II	
Age	28		27		28		28		23	
	A.P.	P.P.	A.P.	P.P.	A.P.	P.P.	A.P.	P.P.	A.P.	P.P.
N. Prot. N.	30	26	36	30	34	27	34	35	38	36
Urea	12	10	16	10	14	11	16	17	18	16
Uric acid	2.4	1.8	2.6	1.8	2.2	2.0	2.2	2.0	3.0	2.8
Creatinin	1.2	.6	.8	1.0	1.4	.9	1.3			
Sugar	80	82	78	84	76	80	125	95	95	92

The blood chemistry is interesting, there being no marked increase in the non-proteid nitrogen, urea nitrogen, uric acid, creatinin or sugar, either before or after delivery. Even in Case 5 who died shortly after being seen for discharge visit and only a short time after the blood was taken for chemical analysis, there was nothing to indicate a sudden decease. The higher sugar figure postpartum in Case 4 was due to the fact that she was getting an excess of glucose over a period of days as part of her treatment following the onset of apparently acute uræmia as previously mentioned. The blood clots show no particular change either before or after delivery. Werner (10) insists that in pregnant women, with an oncoming toxæmia or any kidney disturbance, chloride excretion is one of the first things to indicate the change. In prenatal periods according to his figures 7 to 26 grams of chlorides may be excreted normally in the urine daily and postpartum 11 to 21 grams may be excreted. It can at once be seen that the figures here are at the upper limit of his estimation but that a comparison of the blood chlorides and urinary chlorides places them well within normal limits. From the reports here the only conclusion which can be drawn is that, as far as the individuals are concerned, there is a perfect compensation, so to speak, and hence there is no remarkable change in blood chemistry. This fact is further borne out by the presence of an elevated pulse pressure, proportionate to the hypertension demonstrating that the vascular system is still competent to carry its load. According to Norris (11) the pulse pressure of all five cases would be considered pathological, for he insists that any pulse pressure as low as 20 or as high as 60 is definitely pathological. Statements in regard to pulse pressure as prognostic are hard to interpret. Erlanger and Hooker (12) have shown experimentally that the secretion of urine varies directly with the pulse pressure. It is certain that the urine too must be definitely dependent upon flow through capillary vessels of the kidney and when we attempt to interpret pulse pressure prognostically with such an understanding we are met with the statement of Wiggers (13) who writes that blood flow through capillaries can be gauged neither by the height of arterial pressure nor by their different pulse pressure. In addition Skelton (14) by experimental work has demonstrated that any attempt to draw conclusions as to the output of the heart by a determination of pulse pressure and pulse rate is fruitless. Albutt (15) indicates that the pulse pressure should bear a relationship to the systolic pressure of approximately 1:4. It is fair to state that the pulse pressure may be of value for, with so many factors entering into the question, a cardiac disturbance will usually show fairly promptly in pulse pressure when actual cardiac efficiency is in question.

For the index of kidney function I employed the phenolsulphonephthalein test since it is perhaps the best we have for determining total renal function. Piersol (16) asserts that in normal individuals, the total phthalein output at the end of the test should amount to between 50 and 70 per cent after the intramuscular injection of the dye. A glance at Table II suffices to show that as far as phthalein function is concerned the five patients had normal kidneys.

Frothingham (17) feels that one of the best evidences of disturbed renal functions is the delayed elimination of chlorides in the urine. I did not have the courage to add even 10 grams of salt to the diet before delivery lest a crisis be precipitated, but waited until after

delivery to attempt the test. As has been remarked before in a previous paragraph in connection with blood chlorides, the amount of chloride excreted in urine was within the normal amount usually found postpartum.

The fear of an impending toxæmia forced me to insist upon the ingestion of large amounts of fluid daily with the idea in mind of keeping the kidney well washed out. The amount of fluid excreted daily is all that we could expect from any kidney. With the large amount of fluid taken in, there was without doubt a moderate diuresis and this is quite in keeping with the work of Priestly (18) who demonstrated that the diuresis consequent on water drinking is probably accompanied by changes in the blood, a slight dilution, and a passage of salts and possibly proteins out of the blood. His results coincide with the excretion here and his explanation is that the regulation of the excretion of water by the kidney is of a two-fold nature, that is, a main regulation dependent on the diffusion pressure of water in the blood and a subsidiary modification of this regulation dependdent on the ability of the kidney to hold back water when the diffusion pressure of water in the urine is considerably below that in the blood.

TABLE II

Case	1		2		3		4		5	
	A.P.	P.P.	A.P.	P.P.	A.P.	P.P.	A.P.	P.P.	A.P.	P.P.
Phthalein	51% 22% 73%	54% 25% 79%	47% 20% 67%	52% 21% 73%	45% 30% 75%	40% 25% 65%	42% 29% 71%		39% 27% 66%	41% 22% 63%
Blood pressure	180 110	170 105	190 125	170 110	200 100	170 110	230 125	220 120	240 110	220 110
Pulse pressure	70	65	65	60	100	60	105	110	130	110
Fluid intake	3000 c.cm.	2000 c.cm.	2600 c.cm.	2200 c.cm.	2400 c.cm.	2000 c.cm.	2800 c.cm.	2600 c.cm.	3000 c.cm.	2000 c.cm.
Fluid output	1900	1350	1750	1220	1640	1350	1850	1100	1770	1420
Blood chlorides	7.0	6.9	7.4	7.2	6.8	6.6	8.3		7.2	7.0

The two-hour specific gravity test on the urine was carried out with the fact in view that the variation in specific gravity is dependent directly upon the ability of the kidney to eliminate water normally and at the same time excrete certain inorganic salts and organic waste products commonly occurring in the urine. Mosenthal's mandate (19) that the patient should be taking the usual quantity and quality of food was obeyed. A glance at Table III will show that in the instance of Case 5 there was quite evidently a fixed, low specific gravity. A low fixed gravity usually means that the kidneys have lost their power to concentrate and are unable properly to excrete certain solids. Piersol (20) writes that such a condition commonly occurs in chronic glomerular nephritis and also where there is marked anæmia, diabetes insipidus, and during the elimination of œdema.

TABLE III

Case	Two-hour specific gravity test							Chlorides in the urine
1	A. P.	1.032	1.016	1.020	1.026	1.020	1.012	21.268 gr.
	P. P.	1.026	1.012	1.018	1.028	1.016	1.014	
2	A. P.	1.010	1.018	1.022	1.020	1.028	1.016	20.433 gr.
	P. P.	1.018	1.012	1.024	1.016	1.026	1.016	
3	A. P.	1.013	1.016	1.024	1.032	1.022	1.016	22.106 gr.
	P. P.	1.020	1.012	1.018	1.020	1.016	1.012	
4	A. P.	1.020	1.020	1.006	1.002	1.030	1.026	19.123 gr.
	P. P.	1.016	1.024	1.010	1.010	1.014	1.020	
5	A. P.	1.006	1.010	1.016	1.012	1.010	1.012	21.736 gr.
	P. P.	1.008	1.003	1.010	1.012	1.014	1.012	

OUTCOME OF CASES

The outcome of the cases is interesting. Austen (21) has written that an individual may carry for years a systolic blood pressure of two hundred or more without symptoms subjectively. Verdon (22) insists that the blood pressure may be high for years and that individuals under his own notice have been observed for a period of 10 years with no change in the figures and no untoward symptoms. Janeway (23) reports a death rate approximately of 30 per cent in cases with a systolic pressure of 170 or more, the survey coming 8 years after the primary observation. Topp (24) reports a much higher figure than this. It is to be remembered too that none of these figures was reported in pregnant cases and that the age range was from 40 to 70 years.

Of this series, one died a cardiac death, one had a vascular crisis of the cerebral type but the other three cases are living and well. Of course the usual listing of causes of death in cases of this type is in the order of frequency cardiac, cerebral, and nephritic.

DISCUSSION OF ETIOLOGY

The question immediately arises as to what the primary lesion may be. I believe these cases to be primarily vascular in origin with hypertension as the first evidence of disturbance and the possible nephritic changes as secondary.

Moschcowitz (25) insists that hypertension is a symptom and not a disease entity and on the other hand is the statement of Albutt (26) who terms arteriosclerosis the effect of persistently high blood pressure. Its relationship to nephritis has been observed since the days of Richard Bright and the preponderance of modern medical thought seems to be with Ringer (27), who considers every hypertension case a potential nephritic. The close connection between hypertension and nephritis apparently is confirmed by repeated autopsy reports, such as for example that of Lee (28) who found kidney lesions in 71 per cent of all cases of hypertension and in every case with a systolic pressure of more than 200. We must not lose sight of the fact, however, that there are some cases of high blood pressure which show practically no renal damage, despite the fact that such evidence as that presented by Lee just mentioned that every case with a pressure of over 200 constantly has renal lesions. It is fair to assume with Williams (29) who writes that when arterial hypertension is uncomplicated by nephritis or cardiac decompensation and gives no functional evidence of kidney insufficiency, when there are normal kidney excretions and normal nitrogen values in the blood, we are not justified in making a diagnosis of nephritis. If nephritis were the primary cause of all cases of hypertension, we should expect to find renal damage proportionate to the elevation of pressure, when, as a matter of fact, repeated autopsies have shown this is not the rule. I believe in this series that hypertension is the primary phenomenon with nephritis and scleroses as the secondary changes. The albuminuric retinitis, for example, is a phenomenon probably duplicated in the kidney as far as vessel changes are concerned. The various clinical disturbances are the results of vascular changes. As Austen (30) says: "The nature of the first symptom varies and is possibly dependent upon the vascular abnormality in the various viscera." These cases still happen to be well compensated as is evidenced by the facts of an increased pulse pressure, a variable specific gravity and a sufficient elimination of urine. Warfield (31) observes that an elevated pulse pressure is not only compatible with health but probably is an evidence of compensation in hypertension.

The blood vessels play an active part in contracting and dilating and so maintain pressure rather than by mere mechanical elasticity. Physiology has repeatedly demonstrated the dilatation and contraction of vessels due to mechanical, physical, chemical, or mental nature. The various symptoms occurring in these cases of hypertension are perhaps due to disturbance of blood supply of kidney, heart and brain. The integrity of the kidney as a filter against albumin depends on the adjustment of the blood supply. The action of the kidney and its eliminating work has recently been shown by Richards (32) in an ingenious way. He quite easily demonstrated the glomerular action with changes of blood flow, with elimination following correspondingly. The reserve power of the kidney is the reason why so many changes can be going on with few or no symptoms and little or no functional disturbance. Haidenheim (33) long ago expressed the idea that secretion in the kidney is not definitely dependent on blood pressure but rather to the actual amount of blood passing through the kidney. The rise in pressure is compensatory and forces sufficient blood through the capillaries. Norris (34) states, "A rise in general arterial blood pressure caused by increasing the total bulk of the blood or by augmenting the cardiac output increases the blood flow through the kidneys and consequently renal activity. Experimentally (35) the evidence shows that the reduction of kidney substance to one-fourth normal will give a rise in blood pressure, but the work of Moschcowitz demonstrates that the arterial tree plays by far the major rôle in the numerous cases of hypertension with minimal renal lesion.

The effect of amyl nitrite in these patients further confirmed our belief that the primary

lesion was in the blood vessel. Rzentkowski (36) found in arteriosclerotic patients a greater and more prolonged lowering of the blood pressure despite the increased cardiac activity. The nitrite was inhaled and in the first three patients the average drop was 25 millimeters with a return to normal in 4 minutes. In Case 4, the drop was 25 millimeters, but it was 9 minutes before the pressure returned to its original figure. Case 5 dropped 30 millimeters and was 8 minutes in returning to the original figure, during which time there was labored breathing, cyanosis, and rapid pulse. The difference in response is due to the fact that the sclerotic artery has lost its elasticity.

Wheelon (37) considers hypertension functionally the result of an increased peripheral resistance, a resulting reflex, either of chemical or toxic nature, working directly upon the blood vessels and vasomotor apparatus, and this is practically a restatement of the views of Allbutt (15). Jores (38) says that the lesion consists of a pronounced thickening of the intima of the vessel-wall due first to hyperplasia of the elastic tissue and then subsequently involving the other intimal tissues.

In this particular group of cases the toxic theory of primary injury to the blood vessels seems most pertinent. Cases 1 to 3 are said to have been repeatedly troubled with pyelitis and cystitis although during these particular pregnancies I was unable to demonstrate their presence. Case 4 had distinctly infected tonsils and was under the care of a laryngologist. Tonsillectomy was contemplated but her sudden cerebral seizure interfered. Case 5 presented repeated tonsillitis, a sufficient toxic cause. Shaw (39) feels certain that there are poisons circulating in the blood and causing high pressure by their irritating effect but that they are in no way expressive of kidney action. Such a toxic theory also seems borne out by the work of Okuma (40) who demonstrated vascular changes and acute or chronic glomerular nephritis by the intravenous injection of venom from a crotalin snake.

CONCLUSIONS

1. Hypertension may exist throughout pregnancy with no apparent sign of kidney lesion.

2. Some cases of hypertension in pregnancy may be carried through to a successful termination with careful watching.

3. Cases in pregnancy with hypertension without demonstrable kidney lesions are probably of vascular origin.

4. The most likely cause of such hypertension is that it is of toxic origin with the primary action taking place directly in the arterial wall.

5. The prognosis of such cases is always grave and doubtful both for immediate and subsequent life and the patient should appreciate fully the import of hypertension.

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Note.—Since submission for publication Case 4 has practically recovered with the exception of impaired vision and her blood pressure is 190–100, with all other findings substantially the same.

RADIUM VERSUS OPERATIVE TREATMENT OF FIBROIDS[1]

By N. SPROAT HEANEY, M.D., F.A.C.S., Chicago

THERE is a growing impression among physicians that all cases of fibromyomata of the uterus can and should be treated with radium. I, myself, am not of this opinion, but believe that surgery should be used in the largest proportion requiring treatment, while radium should be used only in a small proportion of cases and those should be well selected.

In order to indicate my own opinions, I have briefly looked over my last hundred cases operated upon and will compare them with the cases treated with radium during the same interim. I find first that during the period I operated upon 100 women, I administered radium to only 8 cases of fibromyoma. The youngest case operated upon was 24 years, the oldest 56, and the average age was below 40. The ages of the radium cases will be given when we detail their histories. In brief, we advise against radium in women under 40 unless poor operative risks, since we believe the retention of ovarian function in young women is important if it can be obtained by leaving sound ovaries in. It seems curious to hear a clinician advise extreme measures to conserve ovarian tissue in his operative work and then later see him totally disregard normal ovarian tissue by advising radium for the treatment of a fibroid in a young woman. Amenorrhœa cannot be produced nor can a fibroid be reduced appreciably in size without producing destruction of ovarian tissue.

Among the cases operated upon we had one death due to pulmonary embolus. This patient was 30 years old and except for the very large pressure-producing fibroid, was otherwise well before operation. In these 100 cases, it would give us a mortality of 1 per cent. We looked back through the records for the 200 preceding cases operated upon, however, and found no deaths in that number. Had time permitted in the preparation of this paper, it would have been instructive perhaps to find out my operative mortality during the last 10 years. The figures at hand, however, are conclusive enough to show that the mortality rate of operation quoted by the ardent advocates of radium therapy is entirely too high. None of the cases treated with radium in this series died.

The operations performed were: vaginal removal of pedunculated fibroids from the uterine cavity, either by morcellation or cervical incision, 7 cases; abdominal myomectomy, 15 cases; vaginal myomectomy, 1 case; resection of the fibroid-bearing portion of the uterus, 4 cases; supravaginal hysterectomy, 22 cases; complete removal of uterus with cervix by the abdominal route, 41 cases; vaginal hysterectomy, 10 cases.

In 56 cases either one or both ovaries were left in. These were all normal appearing ovaries. In only one case was only a portion of ovary left. In 44 cases both ovaries were removed. In 56 cases, then, normal ovaries were conserved for the patient—a result that could not be accomplished with the use of radium. None of these retained ovaries, as far as we know, has caused the patients any subsequent trouble.

Among these cases operated upon we found two cases of gall stones and in one an unsuspected beginning appendicitis. Two diabetics were operated upon. Radium was suggested for the control of the hæmorrhages in both these cases, but we voted for operation because they were otherwise sound, were at the time sugar-free, and we felt that they could better overcome the effect of a quick operation under gas and oxygen anæsthesia than they could the burn and infection of the endometrium after an intra-uterine radium administration. We had one case of unsuspected carcinomatous polyp complicating a pedunculated fibroid of the uterus. This case we reported to you at a former meeting of this society.

A few words regarding operative morbidity, for this is also an important point in deciding between radium and operation.

[1] Read before the Chicago Gynecological Society, February 17, 1922. (For discussion see p. 674.)

One patient developed a temperature of 105° F. and had marked tenderness over the uterus. She was quite ill for 3 or 4 days, but left the hospital shortly after the usual stay. This case had an extensive myomectomy and there was, no doubt, infection of retained wound secretion. She would have done better with a hysterectomy, but it was highly desirable, in this particular case to retain the uterus. Two cases had embolic pneumonia, delaying somewhat their recovery. One patient developed a small abscess in the pelvis following a complete hysterectomy. Opening up the vaginal vault allowed the escape of infected blood and the convalescence then was rapid. One case was a re-operation of a former resection of the uterus. Adenomatous tissue was left in the uterine remnant and such pain was produced by the retained menstrual secretion that a hysterectomy was performed. The patient has since been free of pelvic pain. One patient shortly after a hysterectomy returned with pyelitis. No ureteral stricture was present and the pyelitis lasted but a short time.

When selecting a case for radium, we select as an ideal case one in which bleeding is the principal symptom, where the uterus is not too large, rarely larger than an infant's head (the smaller, the safer), and where the maintenance of ovarian function is not essential. If a patient is a good operative risk, we prefer to operate if the above conditions are not present. The poorer the operative risk the more we must depart from the above ideal; for example, we treated a large fibroid with radium in a young woman who had a very serious heart lesion. We advise against radium where evidences of imflammatory reaction exist in the pelvis; also, and this is important, where the fibroid does not account for all of the patient's complaints. Other operative conditions may exist which will keep the patient from feeling well even if the radium treatment relieves the fibroid symptomatology; for example, a plastic may also be necessary.

The eight cases which I report here were, for the large part, poor operative risks. I am presenting the paper to elicit your discussion, so I will briefly describe these cases.

Case 1. A newly married woman of 40 with a symmetrical fibroid extending to umbilicus. Ergot failed to relieve depleting hæmorrhages. The heart gave evidences of beginning broken compensation. One treatment of 1200 milligram hours was given. The fibroid, 3 months after treatment, was the size of a fœtal head. She has not menstruated since.

Case 2. Very nodular uterus, the size of a fœtal head in a woman of 44. General physical condition, except for menorrhagia, was good—no other operable conditions were present. There had been two operative deaths in immediate family, so patient had great fear of operation. No contra-indication to radium was present, and 1200 milligram hours of radium were given. The uterus is now one-half oversize, amenorrhœa.

Case 3. Patient, age 45; suffered with menorrhagia. The uterus was the size of a fist, and very irregular. No contra-indication to radium. No operable condition present. A small polypoid intra-uterine fibroid was removed by torsion and 1200 milligram hours of radium given. Patient suffers from marked hot and cold flashes and amenorrhœa.

Case 4. Patient, age 45; extremely fat and puffy; with no definite contra-indications to operation except extreme obesity. No other operative condition present. Twelve hundred milligram hours of radium were given. One year later amenorrhœa and the uterus was about normal size.

Case 5. Spinster, age 49, suffered with menorrhagia. She was a good operative risk. A pedunculated fibroid the size of a duck egg was removed by morcellation from the interior of uterus and 1200 milligram hours of radium given. The patient was well 3 months afterward but has not been seen since.

Case 6. Woman, age 46, had never been pregnant, and was frail and delicate. She suffered with paralysis agitans, and menorrhagia. Except for a fist-sized uterine fibroid, the pelvis was negative. Twelve hundred milligram hours of radium were given. She returned without symptoms in one year for re-examination and an ovarian cyst the size of a fœtal head was found. Operation was advised, but refused.

Case 7. Woman, age 50, with dilated heart; blood pressure, 210; multiple abscessed teeth; and fibroid extending to umbilicus. Complained of menorrhagia as the only symptom. An egg-sized fibroid was removed by morcellation from the uterine cavity and 1200 milligram hours of radium given. A few weeks later she had a brisk hæmorrhage of brief duration. The abscessed teeth were subsequently removed. One year later the uterus reduced to about three times normal. It pressed against the bladder and produced frequency. Small showing of blood on two occasions close together. Blood pressure, 160. General health was excellent. A curettage for diagnosis was done and 900 milligram hours of radium given. The uterus now, 6 months later, is normal in size. Amenorrhœa. Patient has

a stricture of the left ureter and has had a recent acute pyelitis with distention of ureter and kidney —quite possibly, in my mind, due to the radium producing an injury to the ureter in the region of the broad ligaments.

CASE 8. Patient, age 35, with marked hyperthyroidism. She had recently had a thyroid operation. Myocarditis. Menorrhagia. The uterus was small. A small polypoid fibroid was removed from the interior of the uterus, and 900 milligram hours of radium given. It is now 6 months since treatment and no menses have occurred. She has some hot and cold flashes.

You will see that I believe that there are very few cases of fibroids that could be equally well treated with either radium or operation. However, a study of a series of cases will show that usually a decided preference for one of these treatments can be shown to exist.

THE DIAGNOSTIC AND CLINICAL ASPECTS OF GONORRHŒAL SALPINGITIS[1]

BY HENRY SCHMITZ, M.D., F.A.C.S., CHICAGO

THE clinical importance of gonorrhœal infections of the female genital tract was probably first recognized by Noeggerath, in 1872 (1). The scientific proof for the observation was rendered when Neisser discovered the gonococcus in 1879 (2). The former took one hundred cases of women who became wives of men who had gonorrhœa and scarce ten remained healthy. "A woman, who at any time has had gonorrhœa, has to expect at some more or less distant period—it may be a month or a year—a subsequent attack of peritonitis in some form. The young, hitherto healthy wife begins to complain a few weeks after marriage. Menstruation commences to be more profuse than formerly, accompanied by dysmenorrhœa and leucorrhœa more or less excessive, especially at periods, followed by severe pains on both sides in a few months. Ultimately she is forced to go to bed, is confined for weeks or months, and remains sterile and an invalid for the rest of her life."

Noeggerath concludes that (1) gonorrhœa in man or woman persists for a whole lifetime in spite of apparent cure; (2) latent gonorrhœa occurs in woman as well as in man; (3) latent gonorrhœa in woman as well as man may evoke an acute attack; (4) latent gonorrhœa in woman manifests itself in the course of time by acute, chronic, or recurrent attacks; (5) the wives of men who, at any time of their lives, have had gonorrhœa are sterile as a rule.

These dicta established at once the clinical importance of gonorrhœal infections of the female genital tract. Since then the disease has received the attention of the best medical minds with a view of bringing about prevention and cure of the scourge.

Gonorrhœa is one of the oldest venereal diseases indigenous to the human race. Of all the known micro-organisms pathogenic for the human organism, the gonococcus has attained the highest degree of parasitory adaptation. It is essentially a mucous membrane parasite, grows only on the mucosæ of humans, and enters the epithelial mucous surface without the latter having sustained a preceding loss of its continuity by trauma, ulcerations, and so forth. The route of infection is always an ascending one. The primary infection ordinarily occurs in the vulva in the virgin and in the cervix in the deflorata. From either place the gonococcus spreads in an upward direction, halting at the internal os uteri, which barrier is usually passed at one of the next menstrual periods. The parasite then invades successively the endometrium, the uterine tubes, and finally the pelvic peritoneum and ovaries.

The demonstration of the presence of the gonococcus in the discharge from the genital organs is positive evidence of the existence of a gonorrhœal infection. In recent cases it is easily done; in chronic cases it offers almost insurmountable difficulties. The various procedures recommended for diagnostic pur-

[1] Read before the Chicago Gynecological Society, February 17, 1921. (For discussion see p. 670.)

poses are microscopic examination of stained smears, cultures and tissues removed from the suspected person, the complement fixation test, and the diagnostic vaccination test.

The diagnostic value of these various procedures has been discussed in many valuable medical literary contributions. Bumm (3) states that the culture of the gonococcus has not given any better results than the microscope. He has never obtained gonococci on cultures, if he had not found them previously in a microscopic examination of a stained smear. The detection of the gonococcus in the tissues of the diseased mucosæ is one of the most time-wasting procedures of microscopy. Norris (4) says when gonorrhœa is latent, the passage of a catheter into the urethra or a slight dilatation of the lower cervical canal will set up a mild traumatic irritation in the discharge from which the organism can often be easily demonstrated. The suspected area can be touched with a stick of solid silver nitrate for the same object.

Van de Velde, quoted by Norris, states that a diagnostic vaccination often produces an increased secretion in which the gonococci are more numerous and are often thus easily found when they could not be previously demonstrated.

In chronic or latent cases three or four slides should be made from the suspected locality and be repeated on 3 successive days. If it is impossible to demonstrate by slides, cultures should be made. A complement fixation test once positive and followed by a negative reaction later on is of great value in estimating a cure.

L. E. Schmidt (5) states that results indicate that a negative reaction obtained with the complement fixation test shows good evidence that the disease is cured. In gonorrhœal histories of from 1 to 10 years, he got 92 per cent negative results. It must be remembered that gonococcal antibodies exist some time after the gonococcus dies or disappears.

Irons (6) affirms that a subcutaneous injection of dead gonococci in persons suffering from gonorrhœa was followed in from 12 to 24 hours by a local and general constitutional reaction. The reaction consists of an area of redness, swelling, and tenderness at the site of inoculation; often increased pain and tenderness in the affected joints and other localizations, together with malaise, increase of fever, and a leucocytosis. This is similar to the tuberculin reaction and is shown to be of value in the diagnosis of obscure cases where gonorrhœa is suspected. Reiter (7) observed this reaction in women suffering from pelvic inflammatory disease of gonococcal origin. Irons states that in positive cases a small area of hyperæmia develops at the site of inoculation.

Sternberg (8) concludes, after an extensive study, that diagnostic vaccination is of much practical aid in the diagnosis of latent cases of gonorrhœa.

Jacoby (9) says that in chronic gonorrhœa in a suspect, smears should be taken just before or immediately following a menstrual period. He dilates upon the necessity of repeated smears. He would consider a case a chronic gonorrhœa where there is a history of gonorrhœa or where there is clinical evidence of a former case in which the smears showed numerous pus cells without gonococci. He would treat it as such. He considers a case as cured only when all inflammatory discharges have ceased. At least six smears taken in succession must be negative. The smears are to be taken from the cervix, urethra, Skene's ducts and Bartholin's glands just before or just after a menstrual period. A smear should also be negative after a provocative injection into the urethra. The gonococci complement fixation test shall be negative. Re-examinations comprising all the above steps and made at the end of one month should also be negative.

Neverman (10) injects 0.4 to 0.5 aolan intracutaneously. The following morning slides are made of the cervical discharge. He claims that it increases the gonorrhœal discharge and that where gonococci are few, they become greatly increased in numbers. The injection causes a skin reaction similar to Irons' vaccination with dead gonococci. There also is a slight general reaction.

Smith and Wilson (11) assert that the complement fixation test is of undoubted value in chronic gonorrhœal infection. None but gonorrhœics give a positive reaction.

In 82 per cent of suspected cases they get a positive reaction, and in 14 per cent a weakly positive reaction, and in only 4 per cent a negative reaction. In their controls of 53 cases, clinically negative to gonorrhœa, they got 100 per cent negative results.

Neisser has suggested the following method of examination for gonorrhœa in women: Insert in the urethra a long-handled, blunted, thoroughly heated "sharp spoon" for the purpose of scraping off the most superficial layers. If Bartholin's gland is the seat of the gonococcus in chronic cases, the stoma is surrounded by Saenger's "maculæ gonorrhoicæ." The mucous secretion may then be expressed and the micro-organism found in it. The cervical canal is slightly dilated after removal of the mucous plug. Microscopic specimens are then prepared from scrapings of the wall lining.

The procedure carried out in our clinic is essentially the same as that of Neisser. If gonococci are not found microscopically in stained smears, then the diagnosis is made solely from the history of the case. When a hitherto healthy woman develops in the first year or so of married life an ascending endometritis and adnexitis it is gonorrhœal in character. Ascending tuberculous and colon bacilli infections are rare. The clinical picture and objective findings also enable one to exclude such infections.

The gonococcus, after being deposited on a mucous membrane, penetrates all the layers of the epithelium. The micro-organisms are arrested in the superficial layers of the connective tissues, and never found in the deep connective tissue, although inflammatory changes are found in this layer. The infection is accompanied by an abundant discharge, a profuse formation of pus cells, and round cell infiltration. Hence the infection is mostly a superficial process. If the mucous glands become involved the infection remains localized in the most superficial layers of the gland ducts. The epithelium of the glandular tubes appears to possess an immunity against gonorrhœal infection.

In acute gonorrhœal salpingitis, the mucous membrane is a deep red and covered in places with pus and fibrin. Otherwise the tubal wall does not show any changes. The tube is soft, not thickened, and freely movable.

If the infection continues, agglutination of the fimbriæ and closure of the abdominal ostium occur and the organ becomes adherent to the neighboring tissues and organs. The tube usually surrounds the ovary and becomes fixed laterally and posteriorly to the uterus and the Douglas pouch. Omentum and loops of bowels are frequently attached to such a tubo-ovarian tumor by fibrinous adhesions. The serous layer is covered with a fibrinous exudate, and the endothelium beneath this is destroyed. The wall becomes thickened and rigid by hyperplasia of the connective tissue and irregular round cell infiltration occurring in places. The mucous folds are thick and densely infiltrated with round cells. A purulent softening of the mucosa is seen in places. Often the entire epithelial cover of the tube is gone, granulation tissue appearing in its stead. A spontaneous cure of the process is still possible at this stage by resorption of the pus and cicatricial contraction of the tubal lumen. However, if the pus increases in amount then a pyosalpinx forms. The mucosa atrophies by pressure or is entirely destroyed by the infectious process, the tube gradually increasing in size. Finally the muscular layer disappears through pressure atrophy.

The course of a primary gonorrhœal tubal infection usually tends to a permanent recovery. The chief dangers in these infections lie in renewed gonorrhœal or mixed infections. Rest in bed in the semiprone posture, the application of icebags or a Leiter coil to the abdomen, soft diet, daily enemata, cleansing hot vaginal douches lead soon to an abatement of the temperature and pain. After 2 weeks, applications of heat as the therapeutic lamp, linseed poultices or Flatau's pelvitherm combined with hot vaginal douches of 20 minutes' duration at a temperature of 105° to 110° F. every morning or evening, usually promote a complete resolution within another 4 weeks. The patient now may be treated for the infection of the urethra, Skene's ducts, Bartholin's glands and the cervix. The method described by Anspach, consisting in the local application of solution of oxychloride of mercury, or the cautery with the nasal

platinum snare as recommended by Dickinson (12), Hunner, and Polak (13), and the tamponing of the uterine cavity with 4 per cent formalin solutions as suggested by Findley (14), are those mostly applied in our work. These local applications are repeated until the discharge disappears and stained smears do not show gonococci. The patient is then discharged. Absolute interdiction of coitus and rest during the menstrual periods are ordered. The patient returns to the clinic either before or soon after each subsequent menstrual period for three times when control examinations of the urethra, Skene's ducts, Bartholin's glands, and the cervix are made according to the plan of Norris, namely, three smears are taken from each area on three successive days. If repeated examinations are negative the patient is considered symptomatically cured. It is obvious that the husband must undergo treatment at the same time and at competent hands. That it is a waste of time and energy to carry out this treatment in a prostitute is evident.

An unfavorable prognosis of the course of the disease is associated with a persistence of the original damage, or renewed attacks or other complicating infections. The latter frequently result from intestinal adhesions. Pathogenic germs endogenous to the intestinal tract may by migration enter the diseased pelvic organs. Such an unfavorable course in primary and recurrent gonorrhœal infections and mixed infection may be recognized by a persistence of the fever, the pain, and the bimanual findings in spite of the above described treatment.

If a mixed infection arises the patient shows symptoms and signs of a continued low-grade infection, though oftentimes stormy and grave symptoms and signs may result. With a low-type mixed infection we observe a mild pyrexia of 100° to 101° F., an increase in the pulse rate, continued unabating abdominal pain and gradual loss of weight and strength. Physical examination reveals a rigidity of the muscles of the abdominal wall, tympanitis, and pronounced sensitiveness over the regions affected. Consecutive bimanual palpations performed at weekly intervals elicit a persistence of the infectious induration of the organs and marked sensitiveness of the parts affected.

If the onset of the complicating infection is ushered in with stormy symptoms we must ascribe them to the virulence and number of the organisms and the lessened resistance of the patient. The subjective symptoms are much more aggravated. Temperatures of 102° to 104° F. are the rule, the pulse rate is 110 to 120 or more, and the symptoms of peritoneal irritation, as nausea, vomiting, constipation, and tympany are marked. Bimanual examination reveals a frozen pelvis; softening of the mass may soon occur and a pelvic abscess pointing in the posterior vaginal fornix is early discernible.

If the diseased processes do not respond to expectant treatment but progress, or the tubes have formed pus sacs which resist every known treatment and cause intercurrent attacks of pelvic peritonitis, then surgical intervention offers the only possibility of relief and cure.

Simple salpingectomy is contra-indicated as subsequent inflammations of the stumps from the chronically infected uterus form a continued source of ill health. The results of surgical treatment are much better and more satisfactory if a panhysterectomy is performed. In young women below 35 years of age the latter procedure, however, is almost always accompanied by a stormy surgical menopause and serious metabolic changes. All tissues which elaborate an important secretion must be preserved. Sterility is the lot of almost every woman who has suffered from a bilateral gonorrhœal salpingitis. In considering surgical action in these cases the question of future fecundity may be ignored in determining the best method of surgical treatment. It is not, therefore, the childbearing possibilities that should dominate a decision in favor of a conservative policy, but rather the preservation of the ovarian function (15).

Large collections of pus in the pelvic cavity or large tubal pus sacs lying upon the floor of the recto-uterine pouch are incised and drained through a posterior colpotomy. The incision should be made with the cautery. The rubber T-drain is removed on the fifth post-operative day. Patient may be permitted to be up and about on the eighth day.

Persistence of temperature after opening the pus sac requires a continuation of the semiprone position. About 65 per cent of patients thus treated are permanently relieved of the subjective symptoms while the rest require additional surgery.

All other cases are subjected to a cœliotomy, which may be safely performed as early as about 3 weeks after the abatement of a recurrent attack or a mixed infection. After the intestines have been pushed up into the upper abdomen and have been protected with gauze pads, the genital organs are gently freed of all adhesions. The ovaries are next carefully inspected. Should they be buried in dense adhesions, cystically degenerated, or the seat of abscessess precluding a future normal function, they must be removed. If one or both of the ovaries can be left behind, it is necessary to preserve their normal blood supply. This is best accomplished by ligating the tubal branches of the ovarian artery separately and by maintaining intact the anastomosis of the utero-ovarian arteries (16). The position of the ovary in the ovarian fossa also should be retained. If the ovaries must be removed I have frequently transplanted ovarian tissues within the abdominal recti muscles. The conservation of ovarian tissue makes it advisable also to attempt retaining the uterus.

The excision of an infected tube implies its total removal including the intramural portion. If both tubes are removed, a wedge-shaped excision of the fundus according to Beuttner (17) is advisable.

The necessity of the total removal of ovarian tissue, of course, demands a panhysterectomy since the cervix is almost always diseased. It is imperative if the cervix is infected or otherwise diseased. The claim that the retention of the cervix furnishes a better vaginal roof I do not recognize.

CONCLUSIONS

1. Gonorrhœal infections of the female genital tract must be actively treated.

2. The diagnosis and prognosis of the course of the infection are solely based upon the repeated microscopic examination of stained smears obtained from the urethra, Skene's ducts, the vulvovaginal glands and the cervical canal, and upon the bimanual palpatory findings considering the course of the tubal infection.

3. The primary gonorrhœal tubal infection is treated conservatively by rest in bed, proper diet, local applications of ice and, later, heat.

4. Infections of the endometrium, the cervix and the vulva are treated by the measures described.

5. Repeated attacks or mixed infections that render the patient a chronic invalid are subjected to surgery.

6. The ovarian function should be preserved in patients of 35 years or less.

7. Abscesses pointing into the vaginal fornix are opened and drained through a posterior colpotomy.

8. If ovarian tissue can be left behind, salpingectomy with V-shaped excision of the interstitial portion of the tube is practiced. Otherwise a total hysterectomy is advised.

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SHORT UMBILICAL CORD[1]

By OTTO H. ROHRLACK, M.D., Chicago

THE general impression that a coil or coils of the cord about the fœtus, especially the neck, although quite frequent, is of no special concern, as many cases terminate without much delay or no delay at all in the duration of labor and that many babies are born with little or no asphyxia, has led many physicians to neglect this condition more than the danger to the mother and baby warrants.

An absolute, positive diagnosis is probably not possible, except in a few rare cases when the coil can be palpated *in utero*. In such cases it is of the greatest concern as they are more difficult to manage. After the delivery of the head or breech, when the cord can be felt or seen encircling the neck or coiled about the breech or limb, it is of less concern, as such cases can be managed with ease. A diagnosis can be made in the majority of cases and the attendant then has a better conception as to the conduct of labor, the mother is saved unnecessary suffering and undoubtedly many babies are saved that would otherwise perish. I believe that it is of sufficient importance to the doctor, to the mother, and to the child again to review the subject, placing special emphasis upon the symptoms that will lead to a diagnosis and a better management of the mother and child.

A short umbilical cord may be defined as one which is sufficiently short as to produce clinical manifestations either on the forces of labor, the passages, or the passenger. Much of the discussion of this paper is based upon 100 consecutive labors in which there were 47 cases of shortened cord, shortness being due either to actual shortness or relative shortness, as coils about the neck, shoulders, body, or legs of the fœtus. A case is also included in which a loop about the neck was combined with a true knot.

It is my belief that a shortened cord will always produce symptoms referable to the powers, passages, or the passenger. The mere length of the cord does not determine, alone, whether a cord is actually short. Coils, whether looped once or many times about the neck or body of the fœtus, do not necessarily mean that the cord is shortened. A true knot is of no special concern unless combined with an actual shortness of the cord which causes it to become sufficiently tight to interfere with the circulation of the fœtus.

There were 4 additional cases in which the cord was coiled around the neck that showed no symptoms; also 5 cases, stillbirths, in which the cord was found about the neck. One death occurred 15 days before labor, in all probability due to a shortened cord. In this case there were 4 coils about the neck. In one, in which the cord was found about the neck, death was probably due to a difficult forceps operation in the interest of the mother. There was one, in which the cord was casually found about the neck of the baby. In this case, no heart tones were heard when the patient was first seen in consultation. Labor was terminated by cranioclasis because of a threatened eclampsia and marked disproportion between the pelvis and fœtal head. There were two, in which the heart tones were absent when the patients were first seen in consultation. The labors were terminated on account of exhaustion of the mothers.

Briefly, a number of general considerations relating to the shortness of the cord may be reviewed with advantage. The length of the umbilical cord is normally about 50 to 60 centimeters. It may be as short as 2 centimeters or no cord at all as related in a case reported by Kinne (1), or it may be as long as 120 centimeters and a cord of 198 centimeters has been reported by Dyhrenfurth (2). A normal or abnormal length cord may become relatively shortened when it is coiled about any part of the fœtus, more often the neck, and many coils have been found: three times by Konikow (3) and Kales (4), four times and two times around the arm by Hamill (5), five times, by Maddren (6), and five times with a loop around the chest by

[1] Inaugural Thesis presented before Chicago Gynecological Society, April 21, 1922. (For discussion see p. 677.)

Felkin (7), seven times by Fjelstad (8), eight times by Beech (9). Wright (10) reports a cord 6 inches long with a loop around the wrist, and Bartrum (11) three times around each leg. A case is reported in the literature by Edgar (12) in which the cord was coiled nine times around the neck. In our series the cord was found around the neck, once, in 33 cases, in one of which it was combined with a true knot, twice in four cases, four times in one case, a total of 38 cases in which the cord was coiled about the neck. In 3 cases the cord was looped around a shoulder. In one case it was coiled around each leg and then one coil about both legs. Actually short cords are much more uncommon as compared with relatively short cords. In our series it occurred 5 times, or in 5 per cent, in comparison to 42 times or 42 per cent of loopings about the body of the fœtus. The frequency of coils about the neck according to Williams (13), is about 25 to 33 per cent. DeLee (14) found it in fully 20 per cent. In our series, the cord was looped about the neck in 38 cases or 38 per cent. The cord may be coiled about any part of the fœtus in innumerable combinations. It is twisted on itself in a spiral form and the blood vessels are somewhat angularly folded on themselves in a longitudinal direction. This allows the cord to stretch and it will stretch according to Duncan (15), on the average, one-sixth of its length without tearing. He also found that the breaking strain averaged 8½ pounds in one, in one as low as 5½ pounds, the highest 15 pounds. It may be nature's way in excessively long cords to coil them about various parts of the fœtus and thus tend to prevent a prolapse of the same which usually results in death of the fœtus. The ability of the cord to stretch tends to preserve the life of the fœtus and does save the life of the fœtus in all of those cases in which the amount of stretching is sufficient to deliver, at least, the head of the baby without interfering too much with its circulation. The fact, that the cord stretches is important, in an actually or relatively short cord, as it usually gives one sufficient notice of its presence, thereby allowing enough time to institute proper proceedings for the safety of the fœtus and the mother. Cords that have been put on a stretch are apparently less twisted and more thinned out, depending upon the degree of the tension. A cord put on tension will at first stretch and if the tension is increased it will either rupture, as in a case reported by Bacon (16), or pull abnormally on the placenta or the fœtus. The traction on the placenta will cause it to become partially or completely separated, if it is loosely or normally attached or will cause inversion of the uterus if markedly attached as in a case reported by Felkin (7). Traction on the navel of the fœtus may cause a sudden shock, and this may account for the sudden cessation of the heart tones. It also may be one of the reasons of umbilical hernia. During gestation the cord becomes coiled about the fœtus, probably because of the movements of the fœtus in the presence of an unduly long cord. In some cases, it might be conceivable but rather improbable, that during labor, the head passes through the loop.

A relatively short cord causes maternal dystocia and asphyxia in the fœtus more often than an actually short cord, as actually short cords are quite infrequent. The danger to the mother because of the long labor is exhaustion and infection. There is, also, danger from hæmorrhage due to premature separation of the placenta and inertia of the uterus and rarely inversion. Veit (17) gives the following morbidity and mortality in untreated cases of coils about the neck: One in seven labors, the baby was asphyxiated; one in sixty-three, dead, compared with one in twenty-five asphyxiated, and one in ninety-two dead, in other cases. He further states asphyxia is three and one half times and stillbirths two times as frequent in primiparæ as in multiparæ; therefore, in multiparæ the asphyxia is much more rare. Still it is four times as great when the cord is around the neck as when it is not. In our series of 38 cases of shortened cord, 25 were mildly asphyxiated, 4 markedly, and in 9 no asphyxia was present. In our 100 cases, deducting 38 cases of shortened cord, there was only one asphyxia of the baby and this was due to a delayed obstructive labor in a contracted pelvis. Meconium was present 10 times during the course of labor. The danger to the child is greater in primiparæ

than in multiparæ, in exact relation to the length of time of the second stage being longer in primiparæ than in multiparæ. The mere fact that the cord is coiled about the fœtus, in itself, does not mean dystocia or asphyxia, but it does mean danger to the mother and fœtus in a degree exactly proportionate to the amount of actual shortening of the cord. The prognosis improves to a remarkable extent when this occurrence is borne in mind and a diagnosis is made, which can be done in at least 95 per cent of the cases, and in which proper treatment is instituted. Out of all the cases recorded in this series, five deaths resulted. Of these five, in one the cord was casually found and the labor terminated on account of decompensation in the mother; in 3 the heart tones of the fœtus were absent when the patients were seen in consultation, and in one death of the fœtus occurred during gestation, 15 days before labor.

King (18) gives the following points on which a tentative diagnosis can be made: pain at the placental site, arrest of pains especially bearing down, depression at the placental site, desire to sit up in the second stage of labor, bleeding during and after a pain. Brickner (quoted by Kosmak, 19) in addition mentions recession of the head in the interval of pain, small quantities of urine passed in the interval between pains after the establishment of the second stage. Kosmak (20) adds long labor, little progress, heart tones becoming irregular. Beech (9), in the case reported, mentions excessive movements on the part of the fœtus 1 week before term. Depression at the placental site he thinks doubtful. Davis (21) reports a case in which murmur in the cord was present. Rougy in discussing Young's (22) paper "The Cord as a Factor in Infant Mortality" says it should always be expected when the head reaches the perineum and there is no progress, and in addition there is alteration of the heart tones of the fœtus. Rachel (23) (quoting Caseaux) mentions insufficient flexion, overrotation of the occiput. Elmore (24) says it prevents engagement, encourages antepartum detachment of the placenta and inversion of the uterus. Bissell (25) thinks it causes occiput posterior positions and interferes with flexion of the head in the first stage of labor. Harvey (26) mentions no descent of the head. Schatz (27) reports listening with the ear to the heart tones of the fœtus. The heart beat ten to twelve normal beats, then sank to one-half of that rate. When pressure of the ear was removed, the normal frequency returned at once, only, after six or seven beats. He then found that pressure over the cord which was around the neck gave the same auscultory results. Humphreys (28) says the mother cries out in the second stage the same as in the first and that there are no bearing-down efforts.

In analyzing all of these symptoms, it is seen, that they depend upon the degree of shortness and location of the cord, whether actually short or coiled about the fœtus, mostly the neck, and the time of the occurrence, whether before labor, in the first or second stage depend upon the time when the cord becomes taut, and then the symptoms will begin to make themselves manifest. The symptoms appear most often, when the head is low down on the perineum and become less frequent, the higher the head is situated in the passages and least frequent, when in the uterus, before rupture of the membranes, during labor, or even at the latter end of pregnancy. The reason for this is that the frequency of very short cords is less than the moderately shortened cord. Many of the symptoms recorded in the literature apply only to exceedingly short cords, and although pain at the placental site, depression at the placental site, inversion of the uterus, funicular souffle, never were observed in our series, it can be seen that under the proper conditions one or more of these symptoms might be present. In one case a funicular souffle was heard during pregnancy and labor, where no shortened cord was found. In our series, a diagnosis was made, based most often upon the behavior of the heart tones of the fœtus and the character of the labor. In the absence of disproportion, the marked variation in the heart tones of the fœtus was observed thirteen times when the head was *in excavatio*, twenty-four times in *infra aditu* and once when *in aditu*. In the further discussion of the symptoms in

detail, it is found that they bear on the three factors of labor, the powers or forces, the passages, and passenger. The force of labor, the uterine contraction, in the first stage, are many times ineffectual on account of the interference of the normal mechanism of labor. The membranes may rupture early because they are more or less unprotected by the presenting part, that is, if the cord is sufficiently short to interfere with descent; for the same reason the cervical dilatation is slow. In the second stage of labor, at the time when the cord becomes taut, the contractions of the uterus and abdominal muscles become ineffectual, there is no bearing down or bearing down is arrested; in fact, the patient frequently cries out, the same as in the first stage. This action of the uterus and the mother is, I believe, of considerable diagnostic importance. The passages beside the slow dilatation of the parturient canal, if the cord is sufficiently short, the attachment of the placenta may be interfered with, resulting in partial or complete separation of the same, which shows itself in bleeding during and after each contraction, or after the delivery of the child. The traction on the placenta may be the cause of the woman desiring to sit up. This was observed in only two women in our series. The effect upon the fœtus is due to traction or compression of the cord interfering with its circulation, and this is the most important effect, causing the heart tones to become primarily slowed or absent, then increasing in frequency to normal or above, and with the next contraction, perhaps, complete cessation and the gradual returning of the same during the interval of these contractions. This results in asphyxia of the fœtus, and if severe enough meconium is passed. If the asphyxia is continued long enough death results. If the interference of the circulation is sudden and this is rare, the movements of the fœtus become violent, the patient speaks of these movements, and they may be seen by the physician. During pregnancy, the woman may speak of the unusual activity of the fœtus for a varied period, and this period may be followed by absence of motion. The woman is examined and no movements or heart tones can be detected, and the death of the fœtus is recorded. Such a case with these symptoms was diagnosed as being due probably to a shortened cord and 15 days later, when the baby was born, the cord was found coiled four times about the neck.

In our series a shortened cord, actual or relative, caused partial separation of the placenta during labor 7 times (tears could be eliminated) resulting in hæmorrhage, during and between pains. This was combined with a temporary absence or slowness of the heart tones, and the absence of characteristic second stage pains. There was also excessive bleeding immediately after labor in 10 cases, probably, most often due to a partial separation of the placenta. The shortened cord interferes with presentation, thus it may be a cause of transverse and probably breech presentation, and, in one of our cases, there was a breech presentation which, by external version, was changed to a head presentation, 2 weeks before term, and at the termination of labor the cord was found about the neck of the baby. It may also be a cause of face presentation as found in one of the stillbirths, deflexion, and parietal bone presentation. The latter was found in 2 cases, over-rotation of the head in one case, interference with the descent of the head in over one-half of our cases, and recession of the head between pains, with a small variability in the degree of descent with contraction in approximately one-third. The engagement of the head in a primipara may be interfered with in the last stage of pregnancy and certainly is suspicious of a shortened cord when it occurs with head presentation, absence of hydramnios, disproportion between the head and the pelvis, twins, and congenital weakness of the abdominal wall. Two such cases appear in this series. A diagnosis was made one week before labor. At labor, in one the cord was found around the neck of the baby, and in the other around the legs. It probably causes a greater frequency in posterior positions of the occiput. In this series there were twenty-one posterior positions, thirteen occipitolævoposterior, and eight occipitorectoposterior.

The treatment is comparatively easy and becomes progressively more difficult, depending upon the location of the presenting part,

usually the head, and the condition of the passages, easiest when the head is on the perineum and more difficult when the head is not engaged. When the head is completely engaged or on the perineum, dilatation complete, heart tones of the baby giving the indication, the forceps are applied, and the fœtus is delivered after a preliminary dilatation of the vagina and perineum digitally, manually or with incision if necessary. If there is interference with the descent of the head, membrances intact, no disproportion and the cervix not completely dilated, the membranes are artificially ruptured, labor is allowed to progress until interference is indicated by the heart tones of the fœtus, either forceps are applied preferably or version after a preliminary dilatation of the passages and the fœtus extracted. If the head is floating, an attempt might be made to slip the cord from the body of the child, usually the neck, or if absolutely short it could be cut *in utero* followed by a version and rapid delivery. If version appears easier than high forceps, it may be done. Posture and pressure upon the uterus is of no special advantage. This probably lengthens the cord in this condition and should be employed only when a slight additional lengthening is all that is necessary to deliver the head. It seems to me, that forceps can be applied with less danger to the child and no more danger to the mother if this condition is present. However, if the head is showing, it may be of advantage to allow the woman to assume a semi-sitting posture. Then the force of the contractions aided by pressure upon the uterus, with a preliminary episiotomy, if the outlet unduly retards the progress of the fœtus will accomplish delivery. When the head is delivered, it may be necessary in order to deliver the body of the baby to free the cord from the neck either by slipping it over the shoulders or head or by cutting it when markedly shortened. This probably would prevent excessive bleeding in the third stage of labor, in some cases, where the placenta has been partially separated by too much traction on the cord in the attempt to slip it over the head. To save the fœtus in our series, forceps were applied 17 times, expression 4 times, expression and episiotomy 5 times, manual rotation 4 times, incision of the cervix once, Voorhees bag 2 times.

CONCLUSIONS

1. Relatively short cords are frequently found.

2. A cord coiled about the neck of the baby rarely produces symptoms unless it becomes relatively shortened due to such coiling.

3. A comparatively low position of the head is frequently found in short cord cases.

4. The points upon which a diagnosis can be made are variability in the heart tones of the fœtus combined with a variation in the forces of labor, presentation, position, and station of the passenger, and the slow dilatation of the passages.

5. Prognosis improves with diagnosis and treatment.

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DEPARTMENT OF TECHNIQUE

TREATMENT OF UNDESCENDED TESTICLE[1]

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CONGENITAL lesions of the external genitals, while not particularly frequent in their occurrence, have been exceedingly difficult of correction and have stimulated an enormous amount of investigative work, with its resulting literature, directed toward the correction of these defects.

In spite of numerous attempts at correction, congenital lesions of the penis are still far from having a proper solution. On the contrary, those of the testicle have responded with far more gratifying results, and offer, indeed, a bright field for plastic surgery.

Let us classify congenital defects of the testicle into those of development, nutrition, and migration.

The anomalies of development, such as polyorchism, anorchism, and synorchism will not be considered, because of their extreme rarity, nor will the anomalies of nutrition, such as hypertrophy and atrophy be discussed, except as they apply to the problem, namely the most important defects involving the testicle—those of migration.

Anomalies of migration may be divided into retention, ectopia, inversion, and retroversion, depending upon whether the testicle is undescended or descended, the former being decidedly more frequent.

A testicle may be arrested at some point along its normal course, and it is then called an undescended testicle or cryptorchism. Should it be pulled in an aberrant position, it is commonly spoken of as an ectopic testicle. This latter anomaly, which is supposed to be due to faulty development and attachments of the gubernaculum testis, is exceedingly rare, so let us devote our attention to a discussion of the more important anomaly—the undescended testicle.

The cause of the testicular retention has not as yet been definitely determined. There are various theories, but, up to the present time, no satisfactory one prevails.

Eccles classifies the causes into those due to disturbances of the mesorchium, those associated with changes in the component parts in the testicle, to atypical development of the route along which the testicle proceeds and to faulty attachments of the gubernaculum.

The mesorchium may be too long, allowing the testicle to have such freedom as to prevent its entering into the inguinal canal, or there may be adhesions between it and the peritoneum, prohibiting its engagement. With respect to the conditions of the testicular attachments, the spermatic vessels may be shortened, the vas deferens may be of insufficient length. The testicle and epididymis may be too large to engage in the internal ring.

The gubernaculum, which is supposed by some to pull the testicle down to its normal position by traction, may be either absent or deficient in its lower attachment, its muscle fibers may be either wanting or materially decreased.

The inguinal canal may be small and ill developed. There have been incidents of a small superficial abdominal ring. Some authors believe that the lack of scrotal development has played its part. In observing these cases, one is particularly impressed with the importance of the fascial coverings of the cord, as the potent factor in the faulty descent.

The fascia, as it emanates from the internal ring is usually the most pronounced barrier to the lengthening of the cord. It can be frequently observed at operation that the mere nicking of these strands will allow the testicle to be pulled into the scrotum. All these factors may have an influence in the production of this anomaly, yet there is still indecision.

A large number of infants at birth have undescended testicles. Wrisburg's statistics show 30 per cent. The majority of these descend to the normal position within a few days or weeks of postnatal life. A certain percentage gradually come down within the first year, so that the physician need not concern himself with this anomaly in the early period of the infant's life.

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But, if the condition persists for one year, the chances of normal descent are exceedingly meager.

There are rare instances where the testicle has descended after 14 years of age, or even in the twenties following a sudden strain. "Ambrose Paré cites an amusing story of Marie Germaine, who, jumping into the ditch in chasing her pigs, returned in tears to the house of her mother and exclaimed that her entrails were coming out of her belly." Whereby her true sex was recognized and she became a man.

Coley, in the Hospital for the Ruptured and Crippled, found 3 per cent of undescended testicles in boys under 14 years of age, 2.2 per cent between 14 and 21, and only 0.2 of 1 per cent after 21. Marshall found 11 cases in 10,800 recruits. And Hempel said, that, of 7,000,000 Austrian recruits, 0.2 per cent were affected. In other words, we may expect this anomaly in two cases out of every thousand, a condition of sufficient frequency to demand our careful consideration. For this reason, I have made analytic study of 55 cases, which occurred in our clinic and in private practice. This condition may be unilateral or bilateral. In infants, it is usually bilateral. Within the first few months, 60 per cent are bilateral. In adult life it is more commonly unilateral. Of the 77 cases reported by Odiorne and Simmons, 15 were bilateral, 39 on the right and 23 on the left. In our 55 cases, 42 were unilateral, 21 on the right and 21 on the left, and 13 bilateral.

I was particularly impressed with the frequency of this anomaly while serving on the draft board, and on inquiring from these individuals why they had kept their retained testicle, most of them stated they had been advised against surgery and were told there was very little chance of bringing the testicle down, that usually the organ had to be removed. A great many of them were wearing trusses for the correction of their hernia, but, of course, for the destruction of the testicle.

Owing to the unsatisfactory result of former days in the handling of this unfortunate condition, pediatricians, particularly, have been prone to advise against any surgical correction. But since there have been such pleasing results through surgery in recent years, this discouraged attitude on the part of the pediatricians and clinicians should be changed, and we hope for their co-operation in this phase of surgery in order to protect such a number of individuals from the consequences which may ensue to the testicle from its malposition.

What are the reasons that would prompt us in advising the transplantation of the testicle?

In the first place, practically every undescended testicle is associated with actual or potential hernia, and this, of itself, should demand a surgical correction. Moschcowitz stated that 100 per cent have hernia. Coley, in 415 cases, found hernia in every instance but 3. In our 35 operative cases, 32 had definite hernias. Other observers quote lower figures. Odiorne and Simmons 57 per cent. On account of the hernia, many of these individuals have worn trusses. This, of course, should be most positively condemned, since by its pressure effects it is almost certain to insure disaster to the testicle. Some authors claim that strangulated hernia is more common in the presence of an undescended testicle.

Second, pain due to the pressure of the surrounding muscles upon the gland is often of sufficient importance to warrant the operation. Repeated injuries from the exposed position of a testicle in the region of the external ring is also troublesome, and should demand correction since such repeated trauma with its resultant inflammation predisposes to atrophy.

An organ so important to the human economy should, if possible, be protected from atrophy. And since the undescended testicle is so prone to this condition, our efforts should be exerted toward bringing it in its natural place.

It is a well-established fact that the undescended testicle suffers pronounced change in function and histology. The spermatogenic function weakens and usually disappears. Eccles and Uffreduzzi claim that but 10 per cent of the spermatogenic cells remain in the adult. Bland Sutton claims that after puberty, practically all the spermatogenic cells are lost. Curling believes so thoroughly that sterility accompanies undescended testicle that he states he is compelled to doubt the parentage of such children.

There are, however, instances of fertility in double cryptorchids. For instance, Beigel found spermatogenic cells in a man 22 years old, with bilateral inguinal retention. Odiorne and Simmons published microphotographs of an undescended testicle from a man 30 years of age. In some of the tubules, there was seen active spermatogenesis. Other observers have found actively motile spermatozoa in adults from 20 to 24 years of age afflicted with bilateral undescended testicle. In two of my cases, I found slightly motile spermatozoa from the head of the epididymis. This fertility is usually short-lived, seldom over 5 to 10 years after puberty. There are instances of persistent fertility, such as the case of Milnar Smith, who reports a double cryptorchid, the father of 5 children.

It, therefore, seems reasonable to attempt to protect a testicle from such pathological changes and give it every chance of normal growth, and while many transplanted testicles may not develop spermatogenic function, I believe a fair percentage will, if correctly placed at the proper time.

Another important element which bears on this problem, is the psychic effect which the undescended testicle has on a certain number of individuals. Many of them are chagrined at their condition and become morose, neurasthenic, and melancholy. And there are instances in which the inserting of celluloid balls has had a pleasant effect upon the mental attitude of the individual.

The interstitial cells of the testicle, which have been definitely proved to have to do with the secondary sexual characteristics, through an internal secretion, are not so easily affected, as these spermatogenic cells. Indeed, many cases show marked increase in the number of these cells. Later on, however, in many instances, they are liable to atrophy and all that may remain of the testicle would be a nodule of fibrous tissue. Should this be bilateral, it is easy to see the effects on the general economy. Lespinasse says a normal testicle taken away from its scrotal position and placed in the abdomen will atrophy. There are instances reported, where individuals with double cryptorchism had one of the testicles transplanted before puberty, the other not, to show, later, a complete development of the transplanted testicle and a complete atrophy of the testicle which was allowed to come down later on of its own accord. This would all seem to indicate, that, for the preservation of this important gland, it should be put into its normal position before the age of puberty.

Hydrocele, gangrene, abscess, and peritonitis are rarer conditions. Four of our cases had hydrocele. Tortion and strangulation of the cord occur almost entirely in the undescended organ. The susceptibility of the undescended testicle to tumor formation has been creative of considerable debate and has been handed to us, really as a tradition. Eccles was one of the first to dispute it, but most authors are of the belief that such testicles are much more prone to neoplasms. Cunningham collected 452 cases of tumors of the testicle. Four hundred and twelve occurred in testicles normally placed and 40 developed in the undescended organ, but we must remember there are 500 times as many normally placed testicles as undescended ones; therefore, this proportion seems to express a decided inclination of the undescended testicle to form tumor.

You should, therefore, be convinced that there is abundant evidence to corroborate the view which is so definitely fixed in my mind—that the undescended testicle should be brought into its normal resting place and at a time early enough to protect it from the consequences mentioned above, provided there is a method of execution which will not execute the testicle.

In our series, there were 30 medical and 35 surgical cases. In the medical cases, there were 17 children and 13 adults. Many of these children were inoperable on account of other acute conditions, such as pneumonia, pleurisy, endocarditis, etc. Some had severe congenital abnormalities, such as hypospadias, exstrophy, and the like, although as a general rule, other congenital defects are not so frequent in the adult in association with undescended testicle. Eight, or 14 per cent of our series had these defects.

A number of the operable patients were unfortunately advised against operation. Of the cases operated upon, there were 19 children with an average age of 6¾ years, and 16 adults. The descended testicle was cited as normal in 35 instances, larger than normal in 2, and smaller in none.

The undescended testicle was described as smaller than normal in 18, normal in 6, and in 11 cases, there was no note.

The testicle may be arrested as has been previously stated anywhere along its path. The most frequent location is within the canal. In our series, there were 14 near the external ring, 30 well within the canal, 7 at the internal ring, 3 intra-abdominal, and 1 femoral or ectopic.

TREATMENT

In early years, that is up to 6 years, the testicle may be encouraged by gentle massage and pressure from above and behind as was advocated years ago by Lengenbeck. Should it not descend either spontaneously or through this encouragement, surgery should be done. The time of election for the operation is certainly before puberty. Most authors believe in not operating on young children, certainly not before 3, on account of inability to keep them dry. Most authors agree that the best age is between 6 and 12.

The treatment of the undescended testicle may be classified as manipulative and surgical. The application of the forked truss, advised early in the history of treatment of this malady, was very ineffective both in bringing down the testicle and in the retention of the hernia. Various traction operations have been employed.

The Landz operation was one of the first. By this method, sutures were placed through the testicle and scrotum and fastened to either a cage or the thigh and continuous traction was exerted on the cord. The operation had few successes and many recurrences.

Starr advised a traction splint, which was fixed to the pubic bone and scrotum and the testicle pulled by this method.

The Schueller's operation was designed because of the belief that the open tunica vaginalis was the cause of the abnormal descent, and consisted in dividing the tunic at the internal ring, forming a new tunic by its lower part and anchoring the testicle to the scrotum by suture or to its fellow on the opposite side.

The Keetley-Torek method consisted in liberating the testicle, correcting the hernia, fixing the testicle to the skin flap on the thigh, with the idea of exerting traction on the cord and at a later operation the testis was liberated from the thigh and placed in the scrotum. The operation was attended with very uncomfortable convalescence, both from pain and liability to infection and its results were inferior to the magnitude of the operation.

All of these traction operations missed the point in that they were unable to correct the cause of non-descent and immediately upon cessation of traction, there was a tendency for the testicle to resume its original place.

Orchidectomy has been done a great deal for this malady and in most instances without any excuse. The objections to it are so apparent that they need but little mention. The only excuse for orchidectomy would be a tumor and possibly the inability to bring the testicle into the scrotum.

In our 35 surgical cases, this operation has been done 5 times. I have never been compelled to castrate and have done the largest portion of these operations, yet on the surgical service, where many of these operations have been done by assistant residents, internes, and uninterested general surgeons, in fact there have been 9 different operators, 23 per cent have been castrated and I dare say in general practice, the percentage is higher than this, which, in itself, should create marked hesitancy on the part of the pediatrician to subject children under his care to surgery. And certainly the promiscuous removal of a testicle is most heartily to be condemned and demonstrates conclusively that this operation should be done only by one who is interested and experienced in this problem.

Replacements of the testicle within the abdomen and closure of the canal formerly had a certain number of adherents and just recently at the Southern Medical Association, a paper was read advocating this procedure. The author stated that in a fair percentage of cases, such a method became necessary. There is absolutely no advantage to this operation. It cures the hernias, but the testicle is exposed to all the dangers which might befall an undescended organ and is placed in a more dangerous locality in case of trouble. There is very little excuse for this operation.

In the correction of an undescended testicle, there are two factors, which we have to bear in mind: first the correction of the hernia, second, the transplantation of the testicle into the scrotum without tension, and without injuring the important structures of the cord, which have to do with its nutrition and its healthful support.

It remained for Bevan, of Chicago, in 1898, to propose an operation which, in many instances, fulfilled the above necessities. This operation is more or less familiar to you all, and consists in the liberation of the hernial sac from the cord, closure of the sac, lengthening of the cord by incision of its coverings, and, if this does not suffice, the ligation of one or the other of the vascular supplies, usually the spermatic.

Bevan believes that the vessels of the vas are sufficient to carry on the nutrition of the testicle. Moschcowitz supports this view, as do also Griffiths and Hill. On the other hand, Mixter showed that the artery of the vas was entirely insufficient to support the life of the testicle and that 92 per cent show atrophy, following ligation of the spermatic vessels. Whereas, only 5 per cent show any atrophy if these vessels, were not disturbed. This has recently been accepted by most authors; therefore, it is essential to preserve the integrity of the important structures of the cord in the correction of this defect.

Keyes in 1917, in reporting 33 cases with 88 per cent perfect results, used a modified Bevan operation and laid great stress on the preservation of the vessel and attached supreme importance to the removal of the fascial investments.

Since 1916, I have been particularly impressed that the fasciæ of the cord are the chief factors in its shortening and have in many instances been able to bring the testicle from the middle of the canal to the bottom of the scrotum by simply nicking the fasciæ at the internal ring, holding the testicle upward and swinging it around a circle, with the center at the internal ring. Nicking the cord on the different parts of its circumference, will often give enough lengthening to suffice. These various modifications of the Bevan operation will generally enable the operator to get the

testicle down without cutting the vessel or nerves of the cord. The vas is usually not shortened; in some instances, it is remarkably lengthened, going downward to the scrotum and back to the testicle. Should it be shortened, it can be freed from its attachments by making traction on the outside, and freeing it with the finger beneath the abdominal wall.

In 1911, Davison, of Chicago, proposed a new method of transplantation. In this operation the posterior wall of the canal is treated much as in the Fowler operation. After ligating the deep epigastric vessels, the posterior wall of the canal is opened, thereby destroying the internal ring. After the vessels and vas are freed, the testicle is put in its bed in the scrotum. The posterior wall of the canal is closed and the cord brought out through the lower angle of the incision.

In 1915, Wolfer modified the Davison operation. His technique consisted in freeing the cord, and bringing it out beneath the deep epigastrics, without cutting them. The rest of the operation was like the Davison operation. I have had to use the Davison modification once.

The one thing that must be understood in operating upon the undescended testicle is that "Patience is the greatest virtue." One can not expect to perform the operation quickly. Often when things look gloomy for a satisfactory transplant, if the surgeon continues in incising and stripping away the intimate fascial investments of the cord, he will be delightfully surprised at his accomplishment.

The results of the modified Bevan operation have been exceedingly gratifying.

Usually it is unnecessary to suture the lower pole of the testicle to the scrotum. It has been my custom, however, to do it simply as a method of steadying the position of the testicle within the scrotum and not for traction.

In certain instances, where the cord, after the fasciæ have been almost completely stripped, shows slight tension after the testicle is placed in the scrotum I have found it best to place two or three traction sutures along the cord in island of fasciæ, uniting the cord at these points to the canal in order that retraction will be obviated. I, also, occasionally put a suture around the neck of the scrotum. This latter, however, is seldom essential.

Bevan reports 415 cases and Coley 500 cases, with results so satisfactory as to do credit to any surgical operation.

In my personal cases, I have had excellent results in practically every one. There were 17 cases done in our clinic on which the vessels were cut. There were 13 cases, in which no vessels were cut, 9 of these latter were my personal ones. The remaining 4 were done by other operators. You will note the preponderance of the cut vessels in bringing down the testicle done by those who evidently did not take sufficient pains.

The testicle was brought down to the bottom of the scrotum 25 times, not quite to the bottom in 3 cases, not mentioned in 1. Of the 3 that were not brought completely down, one is down at present, the other is lower, another has retracted to the ring. Of my personal cases, there has been but one slight retraction.

Glancing at our statistics, though our cases are small in number, we see that when one is careful and painstaking and appreciates the value of a living testicle, his efforts are compensated by very satisfactory results. Whereas, if there is neither patience nor interest, about 25 per cent are castrated and a large percentage of the rest suffer atrophy for ligation of the vessels.

In closing, I believe that the plastic operation for undescended testicle done according to Bevan's technique with certain modifications designed particularly at lengthening the cord without cutting the vessels is an extemely satisfactory operation, attended with a high percentage of cures and a negligible mortality.

CHOICE OF OPERATION FOR DUODENAL ULCER[1]

By LEGRAND GUERRY, M.D., F.A.C.S., Columbia, South Carolina

TO the best of my knowledge and belief we are curing approximately 75 per cent of the cases of duodenal ulcers by simple gastro-enterostomy. In some clinics the proportion of cures may be higher and in some lower than 75 per cent, but the general average, I believe, is fairly represented by the above figure. By a cured case, we mean a case given complete symptomatic relief by operation. To my thinking this proportion of uncured cases, 25 per cent of the total, is much too high, for one must remember that 25 per cent of uncured cases of duodenal ulcer in the aggregate represents a very great volume of unrelieved patients; consequently, any effort made and any reason given by which the porportion of cured patients will be increased, should be carefully considered. In our opinion, one of the things, at least, responsible, is the fact that many of us have formularized our thinking on the question of duodenal ulcer; by which I mean to say we have come to look on duodenal ulcer and gastro-enterostomy as convertible terms. You see what I mean at once: a patient has duodenal ulcer, therefore we must do gastro-enterostomy. This is bad logic and poorer surgery. It would be unfair to make this statement in a harshly critical way, for so many of us, we believe, have fallen down just here, myself included. The operation of gastro-enterostomy for this condition has been placed in a position of such prominence, and deservedly so, by so many men, that we have come to believe that this is the best way to relieve all cases of duodenal ulcer.

Time sufficient has elapsed now, however, and we are beginning to get the end-results. It is becoming increasingly clear that here, as elsewhere, there is a definite place for the proper choice of methods. The whole object of this paper revolves around this point, namely: a judicious selection of method to meet the indications in each individual case.

Two cases just here will serve as a concrete illustration of what we are trying to get at. Two years ago, I saw a surgeon, one of the leading men in our country, operate on two cases for duodenal ulcer, during one morning's clinic. On both of these patients he himself had operated about 2 years before for duodenal ulcer, doing a simple gastro-enterostomy; both patients had been given temporary relief and after the above length of time had recurrence of symptoms; hence the second operation. When the first was operated on, the ulcer was found clear and definite on the anterior surface of the duodenal cap. The ulcer apparently was unaffected in any way by the previous operation and the gastro-enterostomy opening was completely closed. The ulcer was then excised and a straight closure of the duodenum made; the gastro-enterostomy opening was taken down. In the second case, the ulcer was practically identical with that in the first, and was managed in the same way. The gastro-enterostomy stoma, however, in the second case was perfectly patent and normal; this opening was also taken down. The work was done by a man who puts any criticism of technical performance completely aside, yet I am convinced that excision of the ulcers in the first instance would have been better surgery and the surgeon in charge made this point immediately. There are among my own cases two that are practically identical. Additional illustrations from other sources would serve no useful purpose; these are ample to prove that there is increasing room for a proper selection of method to meet the indications in each individual case.

The lesson to be learned from the above cases seems to me perfectly clear and definite; namely, that there are cases of duodenal ulcer in which gastro-enterostomy alone does not suffice.

Balfour, in a recent paper, has touched upon a point which we believe has been little thought of and yet must surely be the fundamental principle in the treatment of all ulcers, duodenal and gastric as well; namely, mechanical and physiological rest to the inflamed part.

John Hilton, in his truly great book on *Rest and Pain*, lays bare the principle that must govern successful treatment of all ulcers. Hilton says, in speaking of the process of repair of wounds in primitive man: "Pain was made the prime agent. Under injury, pain suggested the necessity of, and, indeed, compelled him to seek for, rest. Every deviation from this necessary state of rest brought with it, through pain, the admonition that he was straying from the condition essential to his restoration. He must have observed with astonishment the breaking asunder of the newly formed tissue or the steady development into normal structure, which occurred in exact accordance with the disturbance or rest to the parts, which the sense of pain had enabled him to regulate so accurately, and to employ so beneficially for his own personal

[1] Read before the Southern Surgical Association, Pinehurst, North Carolina, December 13-15, 1921.

relief and comfort. . . . What I have here endeavored to inculcate is that growth and repair bear an exact relation to due physiological rest, local and general."

This principle applies fundamentally to the cure of all ulcers. The method which comprehends this fact will endure; the one which does not, cannot endure. For, in a very real sense, there is no difference between ulcer of the leg, ulcer of the rectum, or ulcer of the duodenum. The same principle underlies the process of growth and repair in both animal and vegetable kingdom.

Just as sleep is man's greatest earthly solace, bringing physiological rest to his tired body and brain, so mechanical and physiological rest to the local ulcer area is the one great essential of repair. Let us remember also, that just as the body chemistry is changed during the process of physiological rest to normal alkalinity, so the chemistry of the local ulcer condition will be likewise changed by mechanical and physiological rest applied to the local area. Any method of operating that applies this principle truly will be successful. With this principle carried out, we will gain three primary points: (1) mechanical rest; (2) physiological rest; (3) altered chemistry, which, in turn, means a healed ulcer.

With this brief statement of the general principles that should underlie the proper treatment of duodenal ulcer, at least as we understand them, we are ready to consider very briefly the choice of methods when dealing in a surgical way with ulcers in this location.

METHOD I

It is very evident from statistics from many sources, that gastro-enterostomy will relieve permanently 75 per cent of all cases operated on. Gastro-enterostomy is an excellent method, it is simple to perform, has an extensive field of application, and the results are good. It is a method to be carefully considered (1) in stenosis of the pylorus; (2) in ulcers that encroach on the lumen of the pylorus; (3) in a highly placed and inaccessible stomach; (4) in perforating duodenal ulcer where we wish to add gastro-enterostomy to simple closure, although pyloroplasty can be used in the presence of perforating ulcer; (5) when the duodenum cannot, for one reason or another, be mobilized. In all ulcers where bleeding is a complication, direct attack must be made on the ulcer itself.

METHOD II

I must confess to a strong liking for the Finney pyloroplasty, and in my personal work this is the operation of choice, whenever the duodenum can be mobilized. This method appeals to me so strongly, because it seems to meet, more nearly than any other, the principles mentioned above.

In a paper by Finney and Friedenwald, published in SURGERY, GYNECOLOGY AND OBSTETRICS, March, 1914, in which the authors review 100 cases of pyloroplasty, we find 5 deaths immediately following operation; 13 cases that were not heard from. Of the 82 cases definitely tabulated, there were perfectly satisfactory end-results in 93.9 per cent of the cases. This is getting the percentage of permanent cures around where it ought to be.

According to Finney, the only contra-indication to the operation of pyloroplasty is inability to mobilize the duodenum.

When adhesions are very dense and there is thickening and infiltration about the pylorus, mobilization of the duodenum is quite difficult and should not be attempted. To me, at least, the dividing line between gastro-enterostomy and pyloroplasty rests in large part on this question of mobilization of the duodenum.

To quote from Finney's article in SURGERY, GYNECOLOGY AND OBSTETRICS: "The special advantages of this operative procedure lie in its affording the opportunity to excise all ulcers in the anterior walls of the stomach or duodenum after direct inspection of the part affected; also the application of treatment to ulcers situated in the posterior walls. It does not greatly disturb the normal relation between the stomach and intestines as is the case in other operations."

Our knowledge of the physiology and mechanics of what happens to the food in the process of preparation of digestion that goes on in the stomach, shows conclusively, we think, that when food first enters the stomach it undergoes a very thorough process of liquefaction and chymification. During the above process it is thoroughly mixed with gastric juice. This is nature's preparation of the food for what happens to it in the duodenum. When the food is thoroughly prepared the pylorus relaxes and the food enters into the duodenum. We know that the duodenum has a churning motion which thoroughly mixes the food in turn with bile and pancreatic juices. What we have eaten is then prepared to pass farther on into the intestinal tract.

We can readily understand that when a patient has been the subject of a gastro-enterostomy, the food is dumped immediately into the last portion of the duodenum without the natural process of preparation. We believe this fact explains why it is that quite a number of patients upon whom a gastro-enterostomy has been performed will get

immediate help from the operation, but after the lapse of a certain length of time, begin to have vomiting, diarrhœa, and many other symptoms of digestive disturbance.

The intestine at this point is wholly unsuited to meet this unusual and unnatural physiological demand. As has been stated, the fact that so many of these cases are cured proves a wonderful adaptability of nature.

Stenosis of the pylorus is the crowning indication for a gastro-enterostomy.

If it is true that the stomach possesses the segmental activity, then it would appear that an operation of this type must interfere with such activity to a greater or less degree.

This is a clear, distinct, and great advantage of pyloroplasty over gastro-enterostomy.

METHOD III

There is an excellent method devised by Balfour which is really duodenoduodenostomy; this method finds its chief application in rather a large duodenum which is freely movable. It is a simpler operation than pyloroplasty and is excellent in cases suitable for its use.

METHOD IV

We have had occasion to do the Horsley operation three times and with excellent results in each case. We believe that pyloroplasty, as time goes on, will have a broader field of usefulness and will be more generally adopted.

Quite a few of the bad results following operations for duodenal and gastric ulcers are due to the fact that sufficient attention is not paid to a strict dietetic régime. Some will think this is a small point, but in my opinion, it is most important. A carefully graded and regulated diet is most necessary. Balfour calls attention to the great importance of focal infections in the etiology of this disease and points out that a systematic search for various foci of infection must be added to the general surgical plan.

In our humble opinion, that operation will hold first place ultimately which, when it has been completed, obeys most closely the following points:

1. When it produces mechanical rest;
2. When it produces physiological rest;
3. When it produces an altered chemistry, which is dependent on the first two points!
4. When the position and motility of the stomach are the least interfered with.

Finally, let us remember this: we are after increasing the number of complete symptomatic cures from 75 per cent to 95 per cent or even more if possible. To carry out the above principle successfully there is room, and lots of it, for the exercise of the very highest degree of surgical judgment and discrimination in the proper selection of method to suit the particular case in hand. It is not primarily a question of the mechanical performance of an operation, but a proper understanding of general principles and the surgical philosophy which rests thereon.

A MUSCLE CLAMP TO BE USED IN THYROIDECTOMIES

By E. V. MASTIN, M.D., Rochester, Minnesota
Fellow in Surgery, The Mayo Foundation

THIS muscle clamp is particularly serviceable in cases in which the sternohyoid and sternothyroid muscles are cut in the course of thyroidectomy. It has three important features: it does not crush or devitalize the muscle, it does not slip, and the downward curve of the handles prevents them from being in the way of the operator. The weight of the clamp

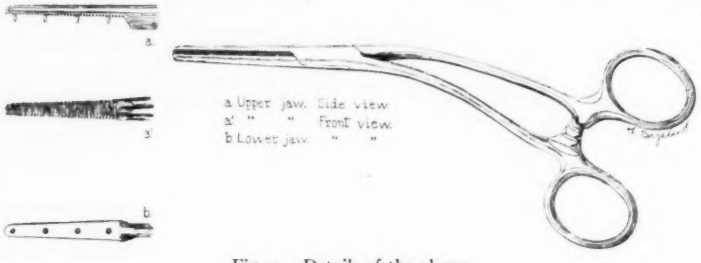

Fig. 1. Details of the clamp.

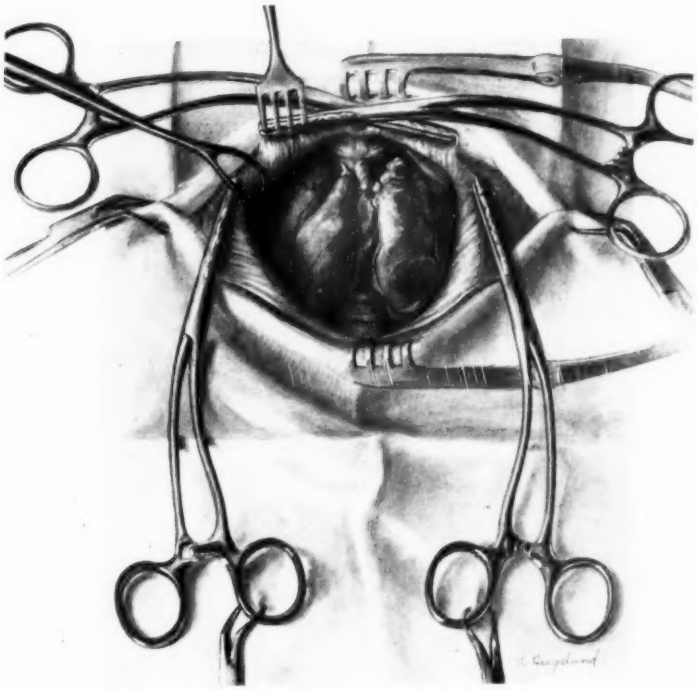

Fig. 2. Clamp in position.

is about that of a 6.5-inch Ochsner clamp, and is constructed so there is $\frac{1}{16}$ inch separation between the jaws when they are closed. The pressure is sufficient to prevent bleeding from the cut edges, yet the muscle is not crushed. The upper jaw is corrugated and contains four pins $\frac{1}{4}$ inch long, which prevent the muscle from slipping. The lower jaw is smooth, and thus is easily slipped under the muscle; it contains four holes $\frac{1}{16}$ inch deep, which admit the four pins in the upper jaw.

A NEW BONE SAW

By MITCHELL LANGWORTHY, M.D., Spokane, Washington

IT may not have occurred to surgeons who have done a relatively small amount of bone work that there is any need for a new bone saw. A casual reading of many of the articles written on this branch of surgery, and a perusal of their drawings and diagrams, have somewhat dazzled the medical profession. The remarkable feats of reconstruction described have unconsciously led the reader to believe that bone surgery is a perfected art. Very little of the grief associated with this kind of work is revealed in the literature. The uncertainty of some of this work is well appreciated, however, by those doing a larger proportion of this class of surgery. One of the principal obstacles to successful results has been the difficulty of working in deep wounds. The type of motor saw in common use is directly responsible for this difficulty. The absence of a natural and accurate control of the rapidly revolving saw, in the ordinary instrument, has also prevented uniformly good results.

With the idea, first, of increasing the usefulness of the motor saw in deep wounds, and, second, of improving the control of the instrument, I began the construction of a new saw in the fall of 1920. It was completed in the spring of 1921, and has been in regular use in my practice, without alteration, since that time. In order to be additionally certain of its strength and durability, I have tested it extensively by sawing dry horse bone. It has done many times the amount of work that a busy surgeon would require of it in the same length of time. Examination of its parts at present shows no signs of wear. I believe it has been sufficiently tested to justify its presentation.

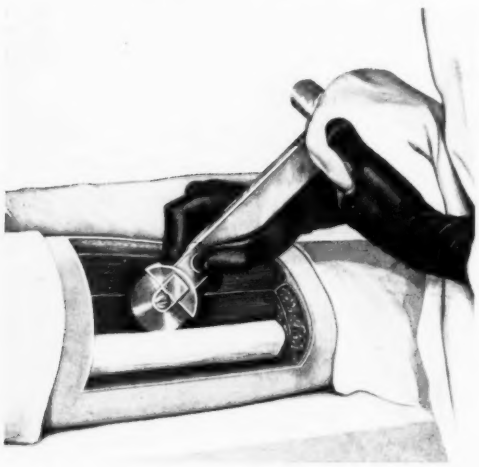

Fig. 1. Sawing on the femur with the Langworthy motor saw. This drawing, showing a section of the soft tissues of the thigh removed, illustrates, much better than do photographs, the relation of the operator, the saw, and the femur, since in actual use the saw is entirely out of sight in the narrow, deep wound. It illustrates how easily the saw can be projected into the wound, in this case approximately 3 inches deep, without endangering surrounding tissues. With the circular saw revolving, as shown, at the extreme end of the long, slender arm, which can be grasped like a pencil, with the fingers close to the saw, accurate and delicate control is assured.

Fig. 2. Laminectomy with my motor saw. This drawing, showing a section of the thick, spinal muscles removed, illustrates how easily the laminæ can be cut on each side of the spinous processes, allowing the removal of the necessary bone in one piece, thus eliminating the tedious work of removing the laminæ and spinous processes piecemeal with a biting forceps. The delicate control possible with this saw allows its use in this region, where the old saws would be extremely dangerous.

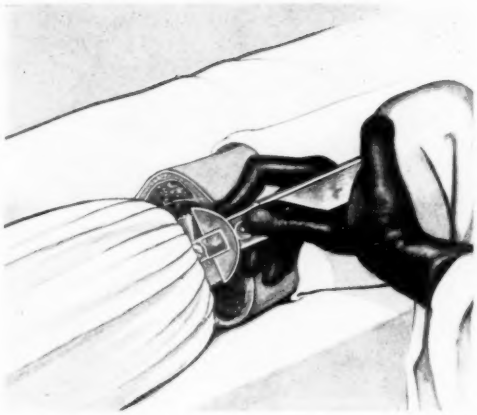

Fig. 3. Amputation of the femur. The drawing is self-explanatory. It is impossible, with the ordinary saws, to cut squarely and continuously across the femur. This is quickly and cleanly done by means of the large, circular saw which is a part of my apparatus. As shown, a minimum retraction of the tissues is necessary, since they are not endangered in any way.

The difficulty of working in deep wounds, with the saws in common use, has been recognized by all surgeons doing bone work. In the instruments with which we are familiar, the circular saw is placed directly on the end of the motor. This makes it impossible for the saw to be projected into a wound for a distance greater than its own radius, because the shaft of the motor impinges upon the soft parts. It has always been necessary that extreme care be exercised to prevent tissues and towels from being wound about the revolving shaft. It is true that much work has been done on the femur and humerus, in spite of the thick muscles which cover them. This has not been accomplished, however, by bringing the saw to the bone, but by bringing the bone to the saw. This has necessitated extensive incisions and much separation of the bone from surrounding tissues. Is it not reasonable to assume that the low percentage of success in bone work on the femur and humerus, compared with that on other bones of the extremities, is due, at least in part, to the relatively greater trauma caused by these extensive incisions? Is it not further true that we rarely do as workmanlike a job on the femur as we do on the tibia? When we can do as neat work, and produce as little trauma on the femur as on the tibia, then surely our percentage of success in the former will begin to approach the 80 or 90 per cent which is being sustained in the latter. A glance at Figures 1 and 5 will explain, much better than further discussion, how the design of my saw permits the operator actually to approach the bone with the saw, without endangering surrounding tissues, through an incision which exposes only as much of the bone as is actually to be worked upon. It is unnecessary to bring the bone to the surface by making extensive incisions and dissections. Thus less trauma is produced, and the blood supply to the bone is less impaired.

It is conceivable that, by constant practice, one might learn to work quite accurately with a saw which is revolving on the end of a yardstick, but, to be used with the greatest precision, a speed tool must be controlled easily, naturally, and directly. Therefore, to be used to best ad-

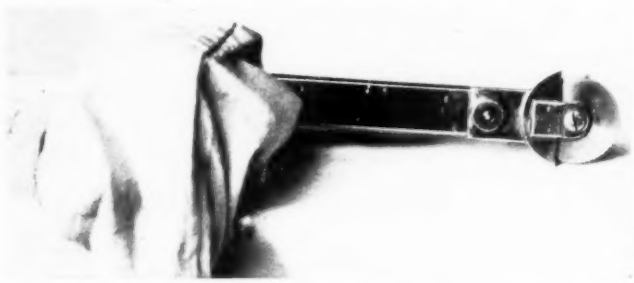

Fig. 4 (at left). The saw ready for use. The motor is covered by a heavy, canvas bag. The handle, or saw arm, is attached to the motor. The saw, with its guard, is attached to the handle. The large, circular thumb nut, by which the saw and its guard are attached to the handle, is clearly shown.

Fig. 5. This is the most important illustration. It shows at once how easily my saw may be projected into a deep wound, without any contact with the surrounding tissues. It shows the pencil-like grip. The fingers are near the saw. The eye is in the plane in which the saw is revolving. The operator is sighting directly over the saw to the line of cutting. The left hand holds the motor, leaving the fingers and wrist of the right hand entirely free to direct the movement of the saw.

Fig. 6 (at left). Attaching saw to handle. The short, square axle of the saw inserts easily in a square hole in the extreme end of the handle. The circular thumb nut on the saw guard screws down over the threaded post on the handle, and fixes the saw firmly to the handle. There is no spring device in this attachment.

Fig. 7. Slotting the transplant. When it is necessary to bend the transplant to fit over a curve, as in some of the operations on the spine, the transplant must be slotted. With the saws in common use this is a two-man job, the assistant holding the instrument on the edge of the table, and the operator holding the transplant and feeding it into the saw. The difficulty of sawing these slots accurately in this way is apparent. The photograph shows how this becomes a one-man job with my saw. This work has been done time and time again, as accurately as shown in the photograph, by surgeons using my saw for the first time.

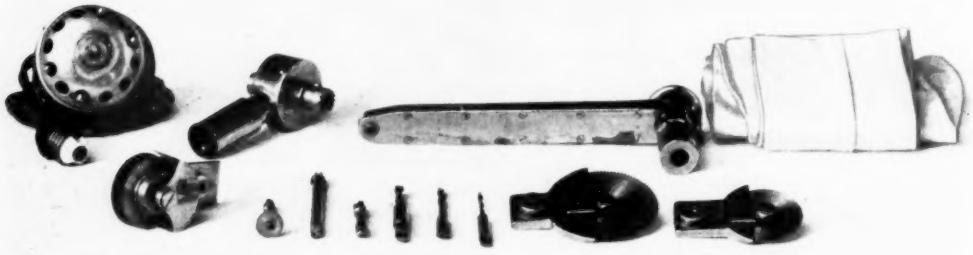

Fig. 8. The complete outfit for bone surgery. Upper row, left to right: (1) Motor. Sewing-machine type; runs on either alternating or direct current. The ordinary form of plug is shown, which connects the motor with the wall cord. No special electrical connections are used. (2) Dowel-shaper attachment for cutting round bone pegs of large or small size. (3) Handle, or saw arm. This is the most important part of the apparatus. It conveys the power of the motor to the circular saw, which is attached to its small end. It is narrow and thin, and is grasped like a pencil. It allows the saw to be projected into a very deep wound. (4) Canvas bag. This is made of heavy material, and covers the motor and its cord.

Lower row, left to right: (1) Twin saw. The two saw blades can be set quickly from one-eighth inch up to one-half inch apart. The narrowest separation can be increased in steps of one-twentieth of an inch each, up to the widest separation. (2) Small cross cut saw. (3) Large reamer, for use in preparing hole through greater trochanter, neck and head of femur, for insertion of a bone peg. (4) Small reamer. (5, 6, 7) Drills, large, medium, and small sizes. (8) Large saw with guard. The guard and saw are in one piece. (9) Small saw with guard. All parts are sterilized by boiling, except the motor, which is covered by the sterile bag.

Fig. 9.

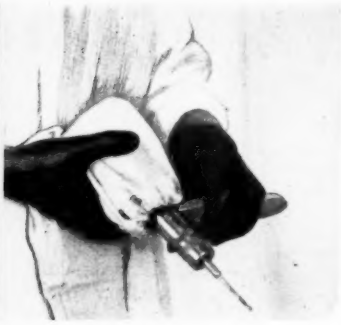

Fig. 10.

Fig. 11.

Fig. 9. Attachment of drills and reamers. These are simply inserted into the cylinder, as shown. The revolving chuck which holds them is enclosed within this cylinder, which does not revolve.

Fig. 10. Manner of holding the instrument, when using the drills and reamers.

Fig. 11. The small cross-cut saw is attached in the same way as the drills, and the instrument is held in the same way.

vantage, a motor bone saw, an instrument of precision, should be constructed so that it is handled as are the instruments of precision in common use. Such instruments are commonly held and handled as is the pencil; in fact, the most common instrument of precision is the pencil. Practice in its control is started in the kindergarten. The etcher, the engraver, and the watchmaker hold their instruments for fine work as they do a pencil. When we wish to use a scalpel or probe for very exact work, we grasp it like a pencil, with the fingers near the point. Another general factor in accuracy is the relative position of the eye, the tool, and the work. In the ultimate analysis, the eye must direct the tool. When the eye, the tool, and the work are in alignment, we are most accurate. It goes without saying that one hand will more exactly control the instrument than will two hands, provided the instrument is not too heavy.

The operator using the ordinary motor saw is handicapped in his attempt at accuracy, because it does not conform to any of the above general principles of accurate control. Reference to the general construction of the old type of saw will show that the pencil grip and accurate control

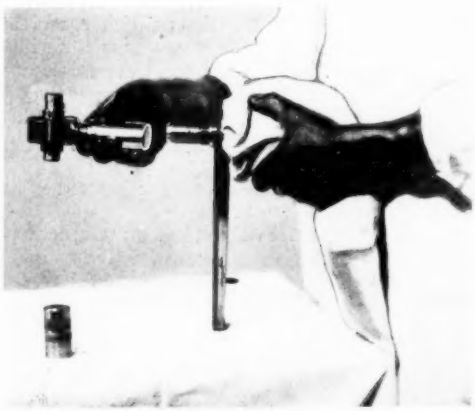

Fig. 12. Attachment of the dowel shaper. The cylindrical cap has been removed and placed on the table. This exposes the revolving chuck. The dowel shaper is slipped over this chuck, and screws down to the handle.

Fig. 13. Dowel shaper in use. The entire instrument is held firmly on the table by the left hand pressing down on the handle. The piece of bone, which is to be made cylindrical, is fed into the revolving cutter with the right hand. This is the same form of dowel shaper as used on the Albee instrument, and is an excellent one.

Fig. 14. Assembling the saw for use. The cord, attached to the motor, has been dropped into the sterile bag. The motor occupies the upper end of the bag, which has been made larger for this purpose. The large end of the saw arm has been placed over the projecting end of the motor shaft. A few revolutions of the arm screws it down to the motor. The upper edge of the sterile bag is then turned up and tied with the drawstring around the projecting collar of the saw arm. The apparatus is thus made ready for use with the fewest and simplest movements possible.

through the wrist and fingers are not possible. The progress of the old saw along a straight line is produced by lateral movements of both arms and both shoulders. The muscles involved in such movements are not habituated to fine control. The fingers cannot be placed near the saw. The saw cuts in a line at right angles to the line of vision. Figure 5 shows clearly why my saw is so easily and accurately controlled. It is held like a pencil. The fingers are near the saw. The eye sights in a straight line directly over the saw. The weight of the motor is carried in the left hand, leaving the fingers and wrist of the right hand entirely free to control the movements of the revolving saw.

This new, bone-surgery apparatus has been made with fewer, simpler, and stronger parts than the old saws. Many manipulations, in assembling the parts after sterilization, have been eliminated. No spring catches are used in the attachment of the saws. They are held in place by a large thumb nut, which screws firmly to a strong, threaded post. Each saw has a guard which protects the fingers, and which keeps the saline solution, which is dripped on the saw, from being sprayed about promiscuously. The saw handle is attached to the motor with a simple thread. There is nothing mysterious about the motor. It is the ordinary sewing-machine type, which runs on either direct or alternating current. All parts are sterilized by boiling, except the motor and its cord, which are covered by a sterile, heavy canvas bag. This ties firmly around a collar on the saw handle. There is only one electrical connection to be made, and this with an ordinary connection-plug and socket. The old type of saw requires a special cord with two special connections, one to the motor through the metal shell, and the other to the wall cord; the former is a source of considerable difficulty at times.

My new, bone-surgery apparatus is made complete by the additional provision of a small cross-cut saw, an adjustable twin saw, different-sized drills, reamers, and a dowel shaper. To avoid a useless repetition of details, the different parts, and their uses, are described fully in the legends accompanying the illustrations. These make more apparent than text the ease with which routine bone work can be done. They also show how the use of this motor saw can be broadened to include amputations, the removal of various-shaped sections of bone, as in the radical operations for chronic osteomyelitis, or bone tumor, and the operation of laminectomy. The technique of laminectomy, and other operative bone work, in which a motor saw has not previously been used, will be taken up in other articles. From the several illustrations which show the saw in use, it can be readily seen with what facility it can be used, both in the most accessible and inaccessible places. This saw does not solve all the problems of bone surgery, but it does simplify a few of them.

SUMMARY

1. My new motor bone saw can be used easily in narrow, deep wounds.

2. It can be used easily and accurately, because (a) it is held like a pencil; (b) the fingers grasp it close to the revolving saw; (c) when sawing, the eye sights directly over the saw in the line in which it is cutting.

3. The various parts, and their means of attachment, are extremely simple and strong.

4. Sawing, drilling, reaming, and dowel-shaping are easily done.

5. This motor saw can be used in many regions which previously were inaccessible to a motor saw.

METHOD OF LOCATING AND BLOCKING NERVUS CUTANEUS COLLI

By J. B. McNERTHNEY, M.D., F.A.C.S., Tacoma, Washington

LOCATING the nervus cutaneus colli is determined by what may be called squaring the region. Successful anæsthesia is based upon a thorough knowledge of anatomy and exact technique. The art of local anæsthesia has successfully progressed in proportion to the operator's skill always to apply the anæsthetizing solutions to the nerve trunk supply within a certain area by means of a safe, simple, and sure method.

The nervus cutaneus colli arises from the second and third cervical nerves. It climbs the posterior margin of the sternomastoid muscle and passes transversely forward supplying the platysma in part and a large cutaneous area on the anterolateral surface of the neck.

Drop a vertical line from the center of the mastoid process, meet this with a transverse line from the mental protuberance of the inferior maxillary bone, and exactly at the intersection of the two lines within an area the size of a ten cent piece will be found the nerve.

Previous to the operation the region is squared, and the location of the nerve is marked with silver nitrate or by any other method the surgeon chooses.

Infiltration of the skin and subcutanous tissue within the small marked area allows the needle to pass painlessly over the posterior margin of the sternomastoid muscle to meet the nerve. Here sufficient novocaine solution is placed to intercept the nerve trunk.

Drawing showing author's method of locating and blocking nervus cutaneus colli.

BENZYL SUCCINATE IN DYSMENORRHŒA[1]

By JOSEPH J. MUNDELL, M.D., F.A.C.S., Washington

THAT woman has suffered pain at her menstrual periods and that relief from the same has baffled her medical attendant from time immemorial is testified to by the voluminous literature on the subject extending from the current journals backward in an unbroken chain into ancient times and, strange as it may seem, the most recent of the current articles are not a great deal more enlightening than some of the earliest contributions, nor will the present feeble effort be an exception in this much treated but little explored field, but will simply relate some observations made in the treatment of a large number of girls during the past few years.

In the earliest medical work extant, the *Papyrus Ebers*, 1550 B.C., it is stated: "When you make an examination of a patient and find that she has disease on one side of her womb, you tell her that she has an obstruction to her menstruation, then having made your diagnosis, prepare a remedy which is applied to the womb." In this the point is stressed as we find it almost harped upon in the majority of late writings, namely, that a correct diagnosis must be made before instituting treatment. Yet, having made such, it is hard to see where much progress is made in the solution of the main issue in the problem, to give relief. It is very interesting to note that the present day adherents of the mechanical treatment of dysmenorrhœa have ample authority as far as precedence goes in their methods, for as early a writer as Hippocrates in a "Treatise on Stenosis and Rigidity of the Cervix," gives an elaborate and detailed description of his method of dilatation by means of a series of gradually enlarging pine rods, which he cautions should be as round and as smooth as possible and have no splinters. If one is not satisfied with this venerable authority, he has to but consult the next best known ancient, Soramus, to find that he also advocates such a procedure, for he says that a menstrual flow which comes only drop by drop is relieved by dilating a too small uterine orifice. If desiring the sanction of authors who do not bear the stamp of such antiquity, we find that at one time in early English history the mechanical treatment was prevalent to such a degree that doctors sat on their front door steps extolling the virtues of their individual stem pessaries.

Regarding the etiology of this condition, there is so much confusion, and there is such a multiplicity of divergent views that one has the choice of any number from which to pick. There are any number of writers, probably the majority, who are firm in their belief that the pain is due to mechanical obstruction within the uterus: stenosis, flexion or what not. Notable among these writers is the famed Marion Sims, who declaimed that without obstruction there could be no dysmenorrhœa. There are numerous others who loudly assert that this is erroneous and they present a variety of theories of causative factors, chief among them being a disturbance of the sympathetic nervous system, which in some instances is fancifully detailed; others give just as capricious explanations of the derangement of the hormones and the endocrines. Endometritis as the causative factor has long since been an exploded supposition. Hyperæsthesia of the circular muscle fibers of the cervix similar to pylorospasm comes from another source. Hypoplasia and mal-development is given by others as a rather plausible coincidence in certain instances. Prominence is given to blood changes by many and probably rightly so, as changes in the clotting properties of the blood, due to the action of the ferments of the uterine glands would undoubtedly result in pain in the expulsion of clots. Other biochemical questions are raised and in fact there is a veritable maize of theories and hypotheses, but nothing definite and tangible has been brought out, for the simple reason that we are dealing with an undetermined pathological entity, and by the very nature of the subject matter it seems to be a hopeless task.

When the pathology of the condition is worked out to the satisfaction of all concerned, then and not until then will we be on the right road to the solution of this time-worn controversy.

As we have seen the myriad of suppositions expostulated in the etiology, so do we find just such a jumble in the classification. No two textbooks give the same classification, and indeed it seems that each writer upon the subject, and they are legion, seems to assume it his divine right to present his own pet classification, for I have counted in the literature no less than 70 types. In this day of standardization, it seems that it might not be amiss to suggest that the section on gynecology and obstetrics of the American Medical Association or one of the

[1] Read before the District of Columbia Medical Society, January 25, 1922.

national gynecological bodies gives this their consideration.

With full knowledge of this chaotic state of affairs and only after deep reflection have I the temerity to join the multitude and offer an original simple classification, and to give my reasons for such a presumption. My classification is: (1) mechanical and (2) endocrinal.

MECHANICAL

It is conceded by the majority, practically all, of the writers that there is an *obstructive* type of dysmenorrhœa and this seems to be the only common meeting ground in the consideration of the whole matter. Opinions differ widely as to the cause and treatment of the obstruction. It seems reasonable to assume if an obstruction be present no matter whether it be congestive in origin or due to a flexion, it is by all means mechanical in its action. There are many who believe that the obstruction is due to congestion, or hypoplasia of the endometrium, which may be granted, but nevertheless this naturally acts mechanically in the production of pain. Under this heading, of course, comes acute anteflexion, which is so commonly found in young unmarried and nulliparous married women. Not all cases of acute anteflexion produce pain, but the condition is so frequently found in unmarried girls, who suffer severe menstrual cramps that it seems unreasonable to suppose that it is not a factor. Other malpositions of the uterus, retroversion being the next most common, come next in importance. Also, included here would be pelvic inflammatory disease, acute or chronic, such as salpingitis, metritis, oophoritis, cellulitis, and appendicitis; also pelvic or abdominal tumors and uterine polyps.

Too many cases have been relieved by surgical measures to doubt that there is a mechanical type of dysmenorrhœa.

ENDOCRINAL

Here we enter the realm of mysticism, wherein the dreamer may soar to celestial heights to his heart's content. I offer it as a cloak as yet, but beyond a doubt, in this field will some day be discovered the solution of this vexed problem. Many healthy, robust, athletic patients present themselves for treatment in whom repeated careful examinations fail to reveal the least vestige of abnormalities. For convenience these are placed in this category. There are many rollicking obese girls, who menstruate irregularly, perhaps two or three times a year, and then painfully, in whom physical examination reveals nothing abnormal. Truly these patients rightfully belong in this class. We are all familiar with the patients who present a picture the counterpart of the latter: Slender frail girls, filled with nervous energy, working hard at whatever task they have, assuming all the responsibilities of home, always fretting, and who never marry. Though usually irregular they always suffer and as years go by all of these conditions are intensified and they become more or less invalids at their periods. Seldom do we find any demonstrable pathology in these girls and plainly they are included under this division. Next comes a most popular variety under this general heading differing from those preceding, however, in that here we do find some pathology. I refer to women in whom we find underdeveloped or infantile uteri, who frequently suffer menstrual cramps. It may be said that it is only by a stretch of the imagination that we can ascribe the undevelopment of the uterus to the endocrines. Because I believe there are few if any who can deny that some disharmony in the endocrine system is responsible for the undevelopment of the uterus, I believe I am safe in placing this variety here, and am content not to offer any further argument for so arranging it. Any ovarian disease, or for that matter disease of any ductless gland producing an overactivity or diminution in ovarian secretion coexisting with dysmenorrhœa would be considered causative of the dysmenorrhœa and would naturally be placed in this category.

It is feasible to assume that in the same individual a complexity of factors may co-exist producing a combination of the two types, for instance a girl with acute anteflexion who is also suffering with hyperthyroidism.

It is often said that dysmenorrhœa is but a symptom. Be that as it may, it has been well established on innumerable occasions that our efforts at symptomatic treatment have met with ignoble defeat. It is harped upon in many writings that successful treatment depends upon correct diagnosis. This in a measure is probably true, but I think only as it regards the selection of the truly mechanical obstructions. If one is fortunate enough once in so often to diagnose a case as of the mechanical type and relieve the pain by some surgical means, he is indeed to be congratulated. If, however, in a girl presenting herself for treatment, we realize that hers is not an uncomplicated mechanical type, but that there are other factors present, bringing the case under the general classification of endocrinal what have we to offer her? What can we prescribe, saying this will cure you?

All textbooks advise against the use of alcoholics in the treatment of this condition, but the remedies most popular among the laity are, gin, ginger, viburnum compound and helonin compound, the two latter containing a much larger proportion of alcohol than gin. If one is of the opinion that these remedies do not give relief in quite a large number of instances, he has but to question women, who use them. However, one hesitates to prescribe remedies of this character if something else can be found which is quite as efficacious.

During the past few years I have had to cope with this condition, symptom or symptom complex, as you wish, upon a large scale. At first I floundered around trying one method after another with little success. Only those who suffered severe pain would submit to examination. Of these there were many in whom were found gross pathological conditions, such as inflammatory disease of the adnexa, etc., which will not be considered here, for naturally surgery is indicated in such cases. Of those in whom acute anteflexion was diagnosed and who consented to surgical treatment there were 25 cases treated by dilatation and introduction of a Wylie stem pessary, which was retained from 1 week to 3 months. In one case an infection was either lighted up or was introduced and she suffered much pain more or less constantly for several months, when she was lost sight of. Two other cases were affected in a similar manner, but to a lesser degree. Ten cases reported marked benefit and the remainder were only slightly improved. About 25 cases were referred to a rhinologist for treatment of the genital spots, as described first by Fleiss, but the results as reported by the patients were so discouraging that this method was abandoned.

Quite a few selected cases of the evident endocrinal type, slender frail, neurotic girls of questionable age, quite plainly not of the vamp description, in whom physical examination revealed no gross pathology, were followed faithfully for several months under intensive treatment with corpus luteum extract and thyroid extract with little or no improvement.

Finally with the introduction of benzyl benzoate by Macht and the later report of its use in dysmenorrhœa by Litzenberg, I adopted it with rather satisfactory results. The early preparations in emulsion were most unpalatable and distasteful. This feature was overcome later by using globules containing the drug in oil; later it appeared in tablets and lately this seems to be superseded by 5-grain tablets of benzyl succinate, which I have been using for some months.

More than two hundred patients have been treated but these observations have been adduced from a series of 80 patients, treated from April, 1920, to October, 1921, who were asked for an expression of opinion as to the benefits derived. This report is based entirely upon the statements of the patients and naturally such a report is not altogether accurate, but it is hard to conceive how conclusions can be arrived at by any other method.

No attempt was made to classify these cases as mechanical or endocrinal for none of the patients would submit to an examination, but as they applied for treatment first benzyl benzoate and lately benzyl succinate was prescribed as a routine with the request that the result of treatment be reported after each period. To insure an unbiased opinion the report was made through a nurse in order that I would not in any way influence their statements. The routine now is two 5-grain benzyl succinate tablets every hour until relief is obtained. Those who reported benefit usually obtained it within 3 doses, some few took as many as eight doses. The majority reported for only 1 or 2 months, a large number reported for 3 months, several reported for 6 months and a few for 8 months.

The severity of the pain is graded as A, B, C; mild cramps under A, moderately severe under B, and very severe under C, and of these we had:

A	40 cases
B	17 cases
C	23 cases

The results are graded as 1, 2, 3: good as 1, fair as 2, poor as 3; of these we had:

1	52 cases
2	20 cases
3	8 cases
Primary	32
Secondary	23
Not stated	25

Six patients reported no benefit whatever. No bad effects from the administration of the drug were reported or observed. Of the 80 cases the pain began before the advent of the flow in 26 and after the flow in 28 cases and in the remaining 26 cases it was not stated.

If after a fair test for 3 or 4 months no benefit is reported, investigation should be made looking toward classification and further treatment.

The conclusion adduced by the analysis of this series of cases would seem to be that benzyl succinate will not cure dysmenorrhœa, but that it relieves the pain and cramps equally as well and probably much better than any other drug or method of treatment of which we are conversant today.

PROLONGED AND PROFUSE POSTOPERATIVE DRAINAGE OF PANCREATIC CYST AND USE OF RADIUM

By CHARLES S. HAMILTON, M.D., F.A.C.S., Columbus, Ohio
Surgeon, Mt. Carmel Hospital

TRUE cysts of the pancreas are not frequently seen by the surgeon. In reporting the case detailed below it is not my intention to discuss the etiology, symptomatology, or modes of treatment of these cysts. The point which I desire to call attention to is the prolonged postoperative drainage of these cysts when the cyst is not radically extirpated.

The case I wish to report was one in which postoperative drainage persisted for 8 months and in which I applied radium postoperatively with apparently good effects.

American housewife of forty entered hospital September 9, 1919. Mother and a brother died of cancer. Patient's general health has been good. She has been married 13 years. She had an attack of appendicitis 3 years ago. Her heaviest weight was 105, immediately before illness it was 98. Habits are good. She is subject to attacks of epilepsy. Patient had a "fainting spell" 8 weeks ago and fell while carrying a bucket of water at her home. She became unconscious and remained so until next morning. Then she noticed pain in the left upper quadrant of her abdomen, with swelling. Physician told her there was a tumor present. She had never noticed this enlargement before. Following this her abdomen became bloated and was tender.

Two weeks after the first attack, about July 28, 1919, the patient was operated upon by a surgeon who told her the tumor was a cancer. At the time of the operation he inserted a tube which drained cloudy fluid in abundance.

Three weeks later patient was operated upon by the same surgeon who reported again that she had cancer. Her physician stated subsequently that the surgeon found inoperable ovarian cyst. By this time the swelling had disappeared, but there was still drainage of fluid through the tube for a week, and following this from the sinus that remained. It was irritating to the skin at this time.

On entering Mt. Carmel Hospital, September 9, 1919, examination showed a slender, sallow woman weighing 100 pounds. The abdomen was tympanitic except for some dullness over the left upper quadrant. Liver dullness normal. No tenderness or rigidity. There was a healed scar of a low median laparotomy incision 6 inches long. The scar of the second operation was 2 inches long, slightly to the left of the umbilicus. In it there was a sinus discharging a clear unirritating fluid. The pelvis and extremities were negative. Before operation temperature was 97, pulse 86, respiration 24. Urine showed specific gravity 1006, and was negative for albumin and sugar. There were a few hyaline casts. Other findings were negative. Blood count not recorded. Wassermann negative. Methylene blue excreted in urine but not in the discharge.

Operation September 24, 1919. The old scar to the left of the umbilicus was opened and the adhesions were released. A tumor was found which proved to a pancreatic cyst extending toward the left kidney, and to the right just beyond the median line Fluid escaped freely during operation. The cyst had been opened between the stomach and colon. A tube was sewed in the cyst and brought out of the upper angle of the wound with a strip of gauze leading down to the sac by the side of the tube. The abdomen presented universal adhesions. The pelvic organs were normal.

Patient made a good recovery following operation. A bottle was connected to the drainage tube and the amount of drainage recorded each 24 hours. Because of leakage around the tube, the amount was imperfect at first, but by October 20 all the secretion could be collected. A chemical examination of the fluid showed that it possessed a digestive action on albumins, fats, and sugars, and was undoubtedly pancreatic secretion. The amount of drainage was as follows:

	Ounces
October 20	30
October 21	24
October 22	20

October 23, 25 milligrams of radium, unscreened, were used in the fistula full depth 1 hour, then in three other areas, 1 inch nearer the surface each time (Dr. Kirkendall).

	Ounces
October 24	29
October 25	29
October 26	26
October 27	16
October 28	16

October 29, 25 milligrams of radium, unscreened, were used in full depth of fistula withdrawing it 1 inch every 2 hours for 6 hours.

	Ounces
October 30	10
October 31	8
November 1	18
November 2	8
November 3	6
November 4	11
November 5	8
November 6	16
November 7	16
November 8	16
November 9	31
November 10	30

November 10, 100 milligrams of radium were used in three tubes, a 50 and two 25 milligram tubes, unscreened in series; the 50 milligram tube at the bottom, used 1 hour, 10 minutes.

	Ounces
November 11	21
November 12	29½
November 13	13
November 14	5
November 15	3
November 16	11
November 17	21
November 18	22
November 19	21

November 21, radium was used again, 25 milligrams unscreened, to the full depth of the fistula for 8 hours. Withdrawn 1 inch each hour.

November 21, 1919, the patient was discharged from the hospital with the sinus draining 21 ounces in 24 hours, the tube having been removed before she left. It was feared that from lack of proper care she might lose the tube in the cyst.

Patient gave the wound little attention after leaving the hospital and the sinus closed after 3 weeks. This caused her no discomfort and she continued to improve. Her appetite was good and she gained 10 pounds in weight.

Two months later she had severe pain and swelling in the left upper quadrant and epigastrium. This lasted 4 days and associated with it was loss of appetite, nausea, and vomiting. During the night "something bursted" and the wound re-opened and discharged fluid again. This immediately relieved her pain and distress. She did not measure the fluid, but the fistula required three dressings daily. The fistula persisted until her return to the hospital.

January 31, 1920, second entry.

Without anæsthesia a tube was inserted into the sinus and a bottle attached as before. There was leakage about the tube so that an accurate account of the amount could not be kept. Discharged from the hospital on February 28, draining 2 to 3 ounces of fluid in 24 hours. No radium was used, but a drainage tube was left in the sinus on this occasion.

After returning home the sinus became so small that she could not replace the tube so she left it out and the sinus closed again after 2 weeks.

April 26, 1920, third entry.

Her wound was entirely healed and there was no tumor felt in the abdomen. Her health was perfect and she was able to do her own housework. Abdominal examination showed two healed scars and no signs of fluid. There was no left upper quadrant dullness as before. As a precautionary measure, radium was used: 100 milligrams (1 millimeter lead, 1 millimeter rubber, 1 millimeter gauze screen) to the abdominal areas, 3 hours each.

The particular matters I think worthy of attention in connection with this case are: (1) the failure in diagnosing the true nature of the cyst after the first operation for supposed ovarian cyst; (2) the persistent drainage and the large amount of secretion; (3) the comparatively slight skin excoriation due to the discharge; and (4) the value of radium in such cases.

As regards (1), cysts of the pancreas are rarely diagnosed prior to operation. Before coming to us this patient had been twice operated upon by another surgeon who on the last occasion informed the patient's physician that an inoperable ovarian cyst had been found and drained. On the patient's entrance there was a profuse non-irritating discharge which had persisted for the 2 weeks since her operation. She was placed under observation for a further period of 2 weeks. While no sign of ovarian cyst could be felt *per vaginam* I was influenced unduly by the statement of the surgeon who had previously operated and assumed that he had drained an inoperable ovarian cyst. A chemical examination of the fluid, if made then, would have cleared the diagnosis at once. On re-opening the abdomen, however, the supposed ovarian tumor was found to be a pancreatic cyst as stated in the case report.

With regard to the persistence and quantity of the secretion, this, during the time it could be measured, varied from 6 or 8 to 30 ounces per 24 hours. When the patient first left the hospital 2 months after I had operated, the sinus was draining 21 ounces in 24 hours. The wound closed temporarily but months later re-opened and again secreted. When the patient was discharged from the hospital a second time, the wound was draining at the rate of 2 to 3 ounces in 24 hours until the fistula permanently closed. The more or less profuse drainage in this case with or without an inserted tube had lasted from the end of July, 1919, to March, 1920, a period of about 8 months after which no clinical evidence of the presence of fluid could be detected and the fistula had definitely closed.

I have had experience with pancreatic cysts in 2 previous cases, but in neither of these was the secretion collected and measured systematically as in this case. However, I can state that (1) in my previous cases there was a rapid diminution of secretion while the patients were in the hospital; and (2) in neither of the patients did the discharge at any period reach 30 ounces in 24 hours. Cushing records discharge of from 500 to 600 cubic centimeters daily. In a case reported by Mason the drainage continued for 43 days, 9½ ounces being the largest amount secreted in 24 hours. Kerr reports a case of pancreatic cyst drainage persisting 15 years with "about half a pound of fluid discharged daily" but which did not prevent the patient from working. Although the amount of the discharge in my case is exceptionally high the persistence is not exceptional. Koerte reported a case in which a fistula persisted for 2½ years. In the case of Murray and Gies the fistula had not healed after 3 years and in Kerr's case above alluded to the fistula and heavy discharge continued for 15 years.

Despite the heavy discharge and leakage of the drainage tube but little skin excoriation was experienced by the patient except in the period immediately following the first operation. When the patient came to me the discharge, though profuse, was not irritating to the skin. Usually the fistulous discharge is excoriating.

Judd reporting on 31 cases of pancreatic cyst treated by drainage in the Mayo Clinic states that most of the wounds drain for several weeks, some for several months, and a few for several years. According to Judd, drainage continues until the mucous membrane lining the cyst has

been completely destroyed. It seems, therefore, desirable to strip out any mucous lining which can be removed without inducing much hæmorrhage, and this course was followed by Judd in a number of cases with apparently good effect. The injection of fluid into the cystic cavity to shorten the drainage period is said by Opie and others to be a dangerous procedure.

Johnson says that the time limit for the automatic closure of a postoperative pancreatic cystic fistula has been arbitrarily fixed at 9 months, and that unless it persists beyond that period operative measures for its exclusion are not indicated.

The fourth point to which I wish to allude is the use of radium in this case. I find no reports in the literature of radium having been used to accelerate the healing of pancreatic fistulæ. After I had operated upon this patient and the wound had steadily drained from 20 to 30 ounces each 24 hours for nearly a month with no tendency to diminish, the radium treatment was instituted with some apprehension as to its effects on the secretory power of the pancreas. Following the first application of radium, the discharge diminished to 16 ounces within 5 days when the second application of radium was made. In the week following this second application the discharge fluctuated, going as low as 6 ounces in 24 hours. In the next few days the discharge again increased and reached its old maximum of 30 ounces when the radium was applied for a third time. From this time until discharge the daily flow averaged 20 ounces.

I have no reason to believe that the cure in this case can positively be ascribed to the radium applications, but the reduction in the amounts of the discharge following the first and second applications is rather remarkable when it is remembered that the cyst had been steadily draining profusely for the 3 months before. So far as one might judge from the look of the case, an indefinite continuation of the drainage process might be expected. Following the use of radium, an irregular diminution of the secretion was observed and an eventual complete cure. How far the radium was responsible for this result is a debatable matter, as it is a well known fact that drainage cures pancreatic cysts. Judd, basing his opinion on the very large number of cases of pancreatic cyst treated at the Mayo Clinic, says: "The results from drainage of the cystic contents are very satisfactory except for the rather prolonged convalescence . . . and the results were just as good in those which were drained as in those in which the cyst was removed."

Therefore, without attempting to draw any definite deduction regarding the value of radium from its use in this case, if it is used in other similar cases with equal results it might reasonably be considered as of value in shortening the prolonged period of drainage and convalescence and hence its use may be considered as a progress in surgery of the pancreas, and possible extension to other postoperative fistulous conditions.

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HARMFUL USE OF CATHARTICS AFTER ABDOMINAL OPERATIONS

By LeROY LONG, M.D., F.A.C.S., Oklahoma City, Oklahoma

IN considering the use of cathartics after abdominal operation, I wish to submit two propositions, each followed by an argument to support it.

1. CATHARTICS ARE OF NO SERVICE AFTER AN ABDOMINAL OPERATION

The truth of this has been demonstrated to my satisfaction through a personal experience as a general surgeon covering a comparatively long period of time. For about 11 years I have not given cathartics after abdominal operations, and the patients have been decidedly more comfortable than in previous years when cathartics were given. I cannot now conceive of a condition that would indicate cathartics after abdominal operation. If food is withheld, if alkaline water is instilled per rectum, if a colon tube is introduced at intervals well within the sphincter and left there when there is distention, if morphine is given as necessary to keep the patient comfortable, it is gratifying to see the perfectly satisfactory course the average patient pursues. On the third or fourth day, if the bowels have not already moved, a low enema of warm water — 1 pint only — is given, and there is usually an evacuation without delay. If there is not, there is no hurry, and the enema is not repeated until perhaps the next day. Patients usually are discharged without ever having had a cathartic either before or after operation.

Meteorism or distention is, in my judgment, a most positive contra-indication for the administration of a cathartic, and yet I am aware that I am taking issue with many surgeons who feel that active measures of this character should be carried out. If there is nausea and vomiting, wash the stomach, give a hypodermatic dose of morphine, introduce a colon tube through the sphincter occasionally, and let the patient alone. Repeat the morphine if necessary — it is rarely necessary oftener than every 4 to 6 hours. But do not, under any circumstances, give cathartics, nor eserin, nor pituitrin, either of which is as bad or worse than cathartics. During my experience of 11 years there has not been, in my own work, a single case of ileus in patients treated in this way, nor have I, in looking back, been able to find one single instance in which my conscience troubled me because I did not give cathartics. I firmly believe, therefore, that cathartics after operation are not only unnecessary, but that the postoperative course is delightfully more smooth and more comfortable when they are not employed.

2. CATHARTICS AFTER ABDOMINAL OPERATIONS MAY PRODUCE DISAGREEABLE SYMPTOMS, AND THEY TEND TO THE PRODUCTION OF DANGEROUS CONDITIONS, SUCH AS ILEUS

This proposition may be changed so that it will appear in a more graphic way in the following syllogism:

Any agent which produces irritation of the intestinal tract is dangerous after an abdominal operation. Cathartics produce irritation, therefore cathartics are dangerous agents and should not be given.

I believe that this syllogism expresses the views of a vast number of surgeons, but a perusal of current literature, some of it coming from teachers and clinicians of reputation, would lead one to believe that it is still the general practice to give cathartics whenever any important symptom referable to the intra-abdominal organs arises after operation. For instance, one clinician of national reputation, in discussing ileus after appendicitis operations, in a comparatively recent article (1) makes this statement: "Paralytic ileus is sometimes a serious or even fatal complication. It is here that proper early use of saline cathartics has been of value." In the same article he advises a teaspoonful of castor oil every hour "until peristalsis with expulsion of gas and fæces is secured." Another, writing from a large Canadian clinic, in an article (2) about 8 months ago, states that the practice in that clinic is to give castor oil at the end of 48 hours, and then pills of aloin, strychnine and belladonna as necessary. Since this author in the same article reports a case in which the rectal injection of two drams of tincture of digitalis in 3 or 4 ounces of water caused the bowels to move freely in 2 hours through its action on the vagus, I assume that his opinion with reference to the physiological action of drugs is at least open to question. There are still many others who begin the administration of cathartics even within the first 24 hours, calomel in divided doses being the drug frequently employed.

I believe that the practice referred to, especially in the presence of marked meteorism, or even evidences of ileus, is an unfortunate, not to say

pernicious practice; I believe that the influence of such teaching is baneful in the extreme.

Normally, there are two main forms of movement in the intestinal tract — the peristaltic and the pendular or rythmic. Normal peristalsis produces constriction of the walls of the intestine, beginning at a certain point, and passing by successive constrictions downward away from the stomach. These constrictions pass successively from segment to segment, each constriction being preceded by an area of inhibition or relaxation, and followed by gradual relaxation. Bayliss and Starling (3) regard this as a reflex which is controlled within the intestinal wall itself through its intrinsic ganglia and their afferent and efferent connections. Rhythmic movements consist of a series of local constrictions of the intestinal wall, the constrictions occurring normally in a uniform and orderly way as a result of local stimuli. These movements are brought about through, first, muscle "tone" which the physiologists describe as a state of continuous shortening or contraction, slight in extent, due to the discharge of subminimal nerve impulses into the muscle, and, second, to the normal "contraction" of the musculature, it being understood that in the musculature of the intestinal tract, in common with the phenomenon in smooth muscle generally, contraction is relatively infrequent, and that it takes place in a leisurely way after a long, latent period, and is followed by a long period of relaxation. In the orderly movements of the intestines there is no distress, and the individual is unconscious of their existence. The flatulence, the colic-like pains, the griping after cathartics, are manifestations of the fact that orderly movement has been destroyed to a greater or lesser extent. The most violent interference with these movements takes place when the mesenteric circulation in the intestinal walls is interfered with, which is a common enough result of catharsis in the presence of many postoperative conditions.

It has been pointed out by a recent writer (4) that during anæsthesia there is paralysis of the nervous mechanism that controls the viscera as well as that of the voluntary musculature. It is argued, therefore, and obviously with reason, that gas colic is primarily the result of paresis of the intestines, and not due to fermentation.

I think that it will be conceded that in practically every abdominal operation there is more or less trauma to the intestinal tract. Even in an interval appendicitis the cæcum is handled, there is a wound left on one side of it, and often, doubtless, the circulation of the blood is interfered with —and sometimes greatly interfered with. Think for a moment of a few examples of intra-abdominal pathology. Consider the surgery of the gall bladder, of the stomach, of the spleen. Consider the cases of abscess with enforced drainage; of spreading peritonitis. Recall the cases of tumors and pus tubes and infectious processes in the pelvis. Just visualize the general run of abdominal operations, and I am sure that you will agree that in all, despite care and training and dexterity, trauma will be inflicted. In the clean cases it is inflicted; in the septic cases it is inflicted and is an additional insult to an already crippled abdomen filled with 25 or 30 feet of intestinal tract that cannot escape, and the normal movements of which are already embarrassed or destroyed.

Given an intestinal tract that has recently been paralyzed; an intestinal tract that has been traumatized; an intestinal tract that, perchance, has been caught in the tentacles of a spreading peritonitis, or that is helping to support the walls of an abscess, what would be the natural conception of the condition of such an intestinal tract with reference to the effect upon its normal movements? Is it not easy to understand that in many of these conditions it is impossible, even without additional irritation, for anything like normal movements to take place? Under these circumstances, would any clear thinking man wish deliberately to place upon the crippled musculature an additional load? And yet that is exactly what happens when a cathartic is given after an abdominal operation. It is difficult to understand the reasoning of the surgeon who advises a splint and bandage and sling for an arm with damaged musculature, but who has no peace of mind nor calm of conscience if he suspects that the intestinal tract in his last operative case is quietly resting and regaining its lost tone. The administration of a cathartic to these cases, such as those to which I have referred, destroys the normal movements, whips up the musculature — a musculature with deficient tone — so that violent effort succeeds violent effort, and surging wave follows surging wave until a traumatized area is reached, or an area fastened to inflammatory exudate, or an area in a zone of peritonitis, when the force of abnormal effort is turned back. Isometric contraction succeeds isotonic contraction because the load is too heavy; the barrier too high. Under the abnormal conditions, there are fibrillar contractions — that is, "separate fibrils or bundles of fibrils contract at different times, giving a flickering, trembling movement to the muscle" (5). Finally, fatigue comes with the abortive idiomuscular efforts of an exhausted or dying musculature.

Whatever may be argued in favor of the administration of cathartics under ordinary circumstances, to advise that they should be administered in the presence of symptoms of ileus, or even marked meteorism, is, in my judgment, a position that is untenable on anatomical, physiological, and pathological grounds. Such employment of cathartics in many cases leads straight to ileus. In no other way can I explain why for 11 years without postoperative catharsis, one has managed to escape without a single case of ileus in those so treated. Meteorism has been a problem many times — the same kind of meteorism that formerly got cathartics, and formerly some of them ended in ileus. One is told that it is due to improved technique, through which trauma is minimized, but that does not explain it, even if it were true, for from the hands of surgeons the country over, surgeons who use good technique and bad, the reports of postoperative ileus continue to come. In a compilation by McGlannan (6) recently brought to my attention, there are listed 276 cases of intestinal obstruction of all kinds, and 10 per cent of them followed drainage operations for appendicitis.

In a group of about a dozen patients in which I have done an enterostomy for the relief of postoperative ileus during the last 5 years, all but three had been given cathartics after operation. Of these three, two were late, and the obstruction was due to rapid recurrence of malignant neoplasms. In all of these the picture inside the abdominal cavity was essentially the same: the bowels blown up and thinned out almost as thin as paper, with a little fluid about the coils. With the exception of the two cancer cases, they were all cases of paralytic ileus, at least no mechanical obstruction was made out, and in those recovering the bowels finally moved in the normal way, the fistula of the enterostomy opening closing without secondary operation.

In these cases the bowel walls were so thin that they were several times accidentally penetrated while suturing, as evidenced by a little leakage at a needle puncture, although small needles were used. It would be enlightening for all those who believe in postoperative catharsis to observe the intestinal tract at such an operation—a tract so distended and with such thinned-out walls that one wonders if it is possible that there was once a musculature in relation with it. H. T. Hicks (7) reporting a case of paralytic ileus, describes the picture just as I have seen it, and his report agrees exactly with reports of many other surgeons. In his case the bowels moved per rectum after temporary relief through an enterostomy tube, and he remarks that "this shows a general recovery of all the paralyzed bowel." Ashhurst (8) appropriately says: "In cases of adynamic obstruction the patient is not ill because his abdomen is distended, but his abdomen is distended because he is ill."

What shall we do then, for the postoperative patient? Give him water per rectum until he can take it in the normal way without nausea. When he is uncomfortable inject morphine. Introduce a colon tube just well above the sphincter and leave it there if he has much gas, withhold food for 3 or 4 days. If he has meteorism, do not give a cathartic, do not give eserin or pituitrin, for they are deadly agents here, but wash out the stomach, give morphine and instill water per rectum, alternating with colon tube. The central idea is to permit the intestinal tract to drain itself, but do not try to drive the contents through it, for its dynamic force is impaired. It should not be our object to whip up a crippled musculature. It should be our object—indeed, I verily believe that it should be our sacred duty—to give it rest, for through rest only can recuperation and recovery take place.

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EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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THE PROGNOSIS OF FRACTURES

IT is narrated of Charles XII, of Sweden, that when, in 1702, he sustained a fracture of the femur in a fall from his horse, he would suffer confinement to bed no longer than 6 weeks; after this short interval he resumed his usual activities, which consisted in spending most of each 24 hours in the saddle, in violent physical activity. While the result in this case was perfect function, presumably without noteworthy deformity, the method of treatment does not appear to have been recorded, so that we cannot argue from cause to effect.

Now from that day to this, or even from earliest historic times to our own, the time required to secure union in a broken bone has not appreciably varied; the reparative processes are precisely the same; and whether the fracture was under the treatment of Hippocrates, of Paré, or of one of our own contemporaries, there must still have been the same exudation, cellular proliferation, formation of callus, and infiltration with lime salts, before the final restoration of bony union. But shall we hence assume that the average period of disability must be the same now, as in the past; and that in the future no more rapid return of function can be looked for than we secure at present? Is surgery to make no further progress?

The investigations of the Fracture Committee of the American Surgical Association, published in the *Transactions* for 1921, show that in this country, at present, the average period of disability for fractures of the femur is 8 months. How are we to reconcile this with a period of disability of 6 weeks only in the case of Charles XII? Is there any surgeon in America, or elsewhere, who today can get his cases of fractured femur back to their work in an average period of 6 weeks? Certainly not. But Charles XII was a very exceptional patient: he had for years led the most strenuous outdoor existence, and his constitution was as hardy and his frame as robust as any known to history. He had all the reparative forces of the most healthy child; indeed, at the time of this accident he had not long passed his own adolescence. If we were to take the average period of disability of fractures of the femur in childhood, we should come much nearer the record set by this Madman of the North; yet even then very few patients could be discharged as fit for duty within 6 weeks.

It is true that age has a very great influence on the prognosis of fractures: a fracture in an infant often will be found firmly united within a day or so of the injury; one in a child up to 10 or 12 years of age probably will require only half the period for bony union that will be required in an adult. And it is after all bony union which is the first and most important thing to secure in a case of fracture. But bony union alone, without adequate function of the soft parts, will not suffice. Surgeons make a mistake, in patients of all ages and especially

in very young children, in regarding the bones as things separate and distinct from the soft parts: the bones were originally formed out of the soft parts, and the younger the patient the more intimate is the physiological connection between the two. The bones depend for their form largely on the action of the muscles, and in the daily use of the limb almost any deformity of the shaft of a long bone in a young child will be spontaneously corrected within 6 months or a year. Even a right-angled deformity of the femur in an infant, I have seen spontaneously corrected before the child was old enough to walk.

In adults, on the contrary, especially those whose bones serve merely as props to keep their limbs from collapsing, and whose muscles are of little physiological use to them, fractures are serious injuries, and unreduced deformities, even in the shafts of the long bones, are with difficulty compensated; while in fractures near to or involving joints, even in children, it is very important to secure as nearly anatomical reposition as is possible.

The more promptly reduction of the fragments is secured, the easier it will be to obtain anatomical reposition; especially is this true in joint fractures and in children. If attempts at reduction are delayed until swelling of the soft parts has reached its maximum, or until it begins to subside, they are not apt to be successful. And the mere fact that the broken bone has been restored to its normal form is very frequently enough to prevent injurious swelling of the soft parts from developing. For the soft parts also are damaged by the accident, and until their supporting framework is restored they can function but poorly if at all; and, as long as the fragments remain greatly displaced, swelling, circulatory stasis, and damage to the soft parts continually increase, until in many cases blood-filled bullæ and excoriations appear as mute witnesses of the neglect of the soft parts. In children, moreover, delay in reduction means early malunion; in adults frequently it means delayed union or non-union.

Then there is the difference, already indicated, between the prognosis of fractures of the shafts of the long bones and of those involving the joints. In the latter, anatomical reposition of the fragments is almost indispensable for good function; while in the former it is quite sufficient to secure that degree of reduction which will insure bony union with preservation of the normal axis, and without undue shortening. Although it was claimed by Velpeau that patients with shortening even up to 6 centimeters did not limp, no one now would be satisfied with such deformity; but we still recognize that function is more important than form, and that a deformity of the shaft, which requires the X-ray to reveal it, may well be ignored.

Of all the fractures of the shafts of the long bones, those of the tibia require the most accurate reduction. This is so because the leg is the only segment of a limb where the joints at both extremities of the bone are hinge joints. In the thigh and the upper arm, though the distal joint is a hinge joint, yet the proximal joint (hip, shoulder) is a ball and socket joint, and any slight axial rotation of the lower fragment persisting after union has occurred may be compensated by slight rotation of the proximal end of the limb. Even in the forearm the existence of the function of rotation in the radiohumeral joint serves largely to compensate for any rotatory deformity which may persist after union has occurred. But in the leg, where both the knee and ankle joints are accustomed to move in the same plane, any disturbance of this relation by axial rotation of one fragment on the other may entail very serious disability. And as the majority of fractures of the tibial shaft are

spiral, any appreciable shortening implies rotation of one fragment on the other. An anteroposterior angulation of the leg bones causes much less disability, because the ankle and knee joints will still have their axes of motion in the same plane.

Let us endeavor, then, to improve the prognosis of fractures: (1) by securing as accurate reduction as is possible (even in shaft fractures) as soon as possible after the accident; (2) by recognizing and treating the accompanying lesions of the soft parts, accomplishing the latter purpose (3) by avoiding too long and too absolute immobilization, by use of such apparatus as will permit early resort to guided active movements whenever these latter will not dislocate the bony fragments; and (4) by caring for the skin surfaces by gentle frictions with cleansing lotions, by careful drying and powdering. Only in this way can we hope to prevent atrophy of the muscles and preserve the suppleness of the joints for the time when full function can be resumed.

ASTLEY P. C. ASHHURST.

THE SPLEEN

WHAT organ offers more field for research work than the spleen! Unique in the number of theories and hypotheses relative to its normal and abnormal states, it presents questions of intense, if not vital, interest. The important part it plays in certain disorders has become familiar, and, while its enlargement in various diseases of the blood is recognized, it certainly does not have to be enlarged in order to be the source of the patient's illness.

Great responsibility is placed upon the surgeon in interpreting the complex problems which arise. It is for him to answer why surgery did not produce so remarkable a result in this case of anæmia as in that one, or why less benefit was derived from the removal of the spleen in one case of cirrhosis of the liver than in another, with practically the same symptoms and an apparently equal chance for cure.

Formerly, surgical treatment was limited to the removal of an enlarged or injured organ, to one with a kinked pedicle, or an abscess or cyst. In these cases there was no doubt as to what step should be taken, but since surgery has been extended to anæmias, jaundice, cirrhosis of the liver, and similar conditions, the surgeon has much to consider.

The spleen is known to be non-essential to the body, yet why is it so closely connected with four of the body's most important systems: the hæmopoietic, the digestive, the sympathico-endocrine, and the reticulo-endothelial? It is supposed to have an intimate association with each of these systems. Why then, in its removal, is no irreparable loss suffered by any one of them?

In the embryo, it has been found to develop from mesodermal tissue, located near that which forms the framework of the liver as it grows from the foregut. It is believed to extract from the blood certain products which it turns over to the liver—not only waste material but substances which the liver must return to the body for the maintenance of health. This relation to the liver in action has been compared to the glomeruli and tubules of the kidneys. It has been termed the "scrapping plant" where the worn-out vessels are delivered, for the removal of whatever may be of no further service to the body. While not primarily involved in infections, it can become a focus by removing from the circulation organisms which it can not destroy. Such focus in the spleen could bring about a destructive process in the liver.

We have long considered the spleen a blood-forming organ; it certainly is concerned in the formation of red cells during fœtal life.

If, as has been stated, the proportion of the portal blood derived from the normal spleen is about one-seventh of its total volume, consider for a moment the quantity that must pass through the splenic vein in an enlarged spleen. Is it any wonder, that in splenomegaly the liver is burdened, that, following splenectomy, the hepatic cells are greatly relieved?

We are aware of the spleen's relation to the digestive tract, because it increases the lymphocytes in the mucous membrane of the intestines, thereby exciting peristalsis; aids the liver in returning material for the blood; assists the pancreas—suggested by its anatomical features; participates in chemical composition, and in purin, fat, and iron metabolisms.

We feel certain that it possesses the function of offering resistance to systemic infections, that the evidences of its defensive properties are so strong they should not be lost sight of when considering surgery of this organ.

There seems to be no doubt that there is some interaction between the spleen and the endocrine glands. While we do not class it as one of the group of endocrines that has ever yielded an external secretion, we do believe it activates through the sympathetic nervous system and has something to do with at least the thyroid and the thymus.

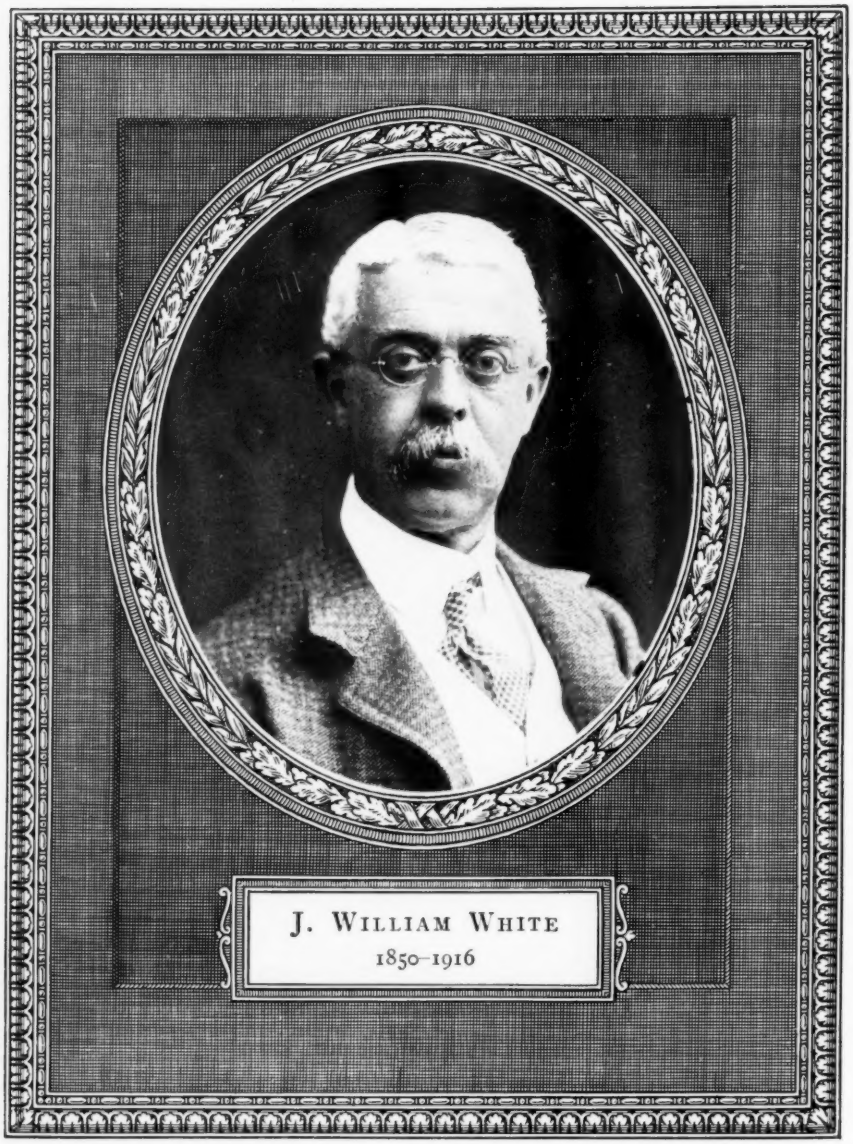
Research workers may make more clear the curious vascular position of the spleen; why its tortuous artery is so different from the other arteries; the significance of the attachment of its vein to the tributary veins; why all of its venous blood passes through the liver; how it can balance up the thyroid and why its removal may activate the thymus. Investigators may explain why, in its primary association with the lymphatic system, this organ is so unlike any other part of it.

The day has passed when we assume that a disease affecting an organ is necessarily restricted to that particular organ, and in the case of the spleen, with its intercommunications with the different organs by means of common veins, arteries, nerves, and connections, we believe it has a rôle in the etiology of diseases whose most prominent symptoms "may be evoked by the association of consecutive affections of other organs."

Instead of looking for a specific splenic disease, we are directing our attention to the functioning capacity of various organs likely to be concerned. May not symptoms point to the spleen even though it is normal in size? May not the focus be in the spleen, yet the clinical symptoms present a picture resulting from parts played by other organs in a process begun in the spleen? Splenectomy may remove the process and we may still find that all the other parts concerned will not return to normal. In other words, we are dealing with disorders of certain systems of the body which produce a morbid condition in an individual. What are we to do? Make an effort to discover the type of infection. When the lesion is discovered, ascertain if it causes poisons that produce hæmolysis, cirrhosis, jaundice, or some other condition. Seek the site of the lesion in the hæmopoietic, the digestive, the sympathico-endocrine, or the reticulo-endothelial systems.

While the spleen is regarded as not isolated but one of a group, connected with and influenced by the activities of other viscera, the future may lay bare its exact connection with these organs and clear up existing problems, many of which are centered in the splendid results following surgery in certain diseases and the less beneficial effects in others. We trust the time will come when the surgeon can explain why splenectomy does not always result in the expected cure, limited progress of a disease, or favorable influence on its course.

E. C. MOORE.



J. William White
1850–1916

MASTER SURGEONS OF AMERICA

J. WILLIAM WHITE

J. WILLIAM WHITE, M.D., PH.D., LL.D. (Aberdeen), late emeritus professor of surgery, and trustee of the University of Pennsylvania, was born in Philadelphia, November 2, 1850, and died at his home in that city, April 24, 1916, after an illness of several months.

He was descended from the Reverend Henry White, who came from England in 1649 and settled in Virginia. Four later generations lived in North Carolina. James White of the fifth generation moved to Burlington, New Jersey. A son married Mary Stockton, a descendant of Richard Stockton, a signer of the Declaration of Independence. Dr. White's father came from this union. His mother was connected with the well-known New England families of Dowse, Hunt, Isbell, and Griswold.

Having attended the public schools and a private school in his native city, Dr. White entered the Medical Department of the University of Pennsylvania and graduated in 1871, and at the same time received the degree of doctor of philosophy, having taken the course leading to this degree simultaneously with his medical studies.

In the autumn of that year he accepted an invitation to join the scientific expedition headed by Professor Agassiz, sailing on the U. S. S. Hassler from Boston, December 4. The stops made included the West Indies, the Strait of Magellan, both coasts of South America, Juan Fernandez Islands, the Galapagos Archipelago, Panama, and Mexico; the expedition terminating at San Francisco in August, 1872.

On Dr. White's return to Philadelphia, he served as resident physician in the Philadelphia Hospital, and subsequently filled a similar position in the Eastern Penitentiary.

His connection with the University of Pennsylvania began in 1876, when he became an assistant on the surgical staff. Two years later he was appointed lecturer on venereal diseases and was placed in charge of this department of the out-patient service. In the early 80's he became assistant to Dr. D. Hayes Agnew, professor of surgery in the University of Pennsylvania, an association that continued with the greatest cordiality and satisfaction to both, until Dr. Agnew resigned on account of advancing years. In 1886 he was given the title

of clinical professor of genito-urinary diseases. In 1889 he was elected to the chair of clinical surgery; and in 1900 was advanced to the position of professor of surgery.

In 1906, Dr. White received the degree of doctor of laws, from the University of Aberdeen on the occasion of the celebration of its four-hundreth anniversary, and was chosen as the spokesman to present the felicitations of all of the American universities.

His contributions to medical literature were frequent, and were conspicuous as examples of clear thinking and forceful presentation. He was joint translator and editor of *Cornil on Syphilis* (Simes & White), 1875; joint editor of the *American Text Book of Surgery* (Keen & White), 1896; joint author of *Genito-Urinary Surgery* (White & Martin), 1897; collaborator to Piersol's *Human Anatomy*, 1907, and to a number of other textbooks. Among his contributions to medical journals may be mentioned: "Hereditary Syphilis," "Dislocation of the Tendon of the Long Head of the Biceps Muscle," "Iodide of Potassium in Syphilis," "The Surgery of the Spine," "The Present Position of Antiseptic Surgery," "The Supposed Curative Effects of Operations *Per Se*," "The Modern Treatment of Vesical Calculus in Male Children," "The Treatment of Glandular Tumors of the Neck," "Tumors of the Female Breast," "The Abortive Treatment of Syphilis," "The Topical Treatment of Focal Epilepsy," "The Roentgen-Rays in Surgery," "The Surgery of the Hypertrophied Prostate," "The Treatment of Delayed Union and Ununited Fracture," "The Diagnosis and Treatment of Appendicitis," "The Value of Early Operations in New Growths," "The Surgical Affections of the Kidneys," etc., and also a memoir of Dr. D. Hayes Agnew, and numerous addresses.

Although Dr. White resigned the professorship of surgery in the University of Pennsylvania on January 1, 1911, and retired from practice, his activities were not diminished, but were turned in other directions. He was made emeritus professor of surgery, and elected to the board of trustees of the University, in which position he served his Alma Mater with untiring zeal until his death.

In the board of managers of the University Hospital, of which he was a member, and in the athletic association of the University, he exercised a dominating influence. He was equally active as a member of the board of commissioners of Fairmount Park, of the board of managers of a large saving fund society, and in many other useful public movements.

Dr. White was endowed with unusual vitality and an inexhaustible energy. He was deeply interested in physical education and inaugurated this department in the University of Pennsylvania in 1884, becoming the first professor of this subject. He was also an ardent advocate of out-of-door exercises. In his earlier years he was a very active and enthusiastic devotee of sparring, swimming, rowing, steeplechasing, and bicycling. In his more mature years he found an outlet

for his energy in golf and mountain-climbing; and was a member of both the Swiss and American Alpine Clubs. However, he never allowed these diversions to interfere with a faithful attention to his patients, or to his hospital or teaching duties.

In the faculty of the Medical School of the University of Pennsylvania, Dr. White was a source of great strength. His teaching was noted for its soundness, clearness, and force. He held the interest and attention of his classes, to an unusual degree, and enjoyed in the largest measure the confidence and respect of the students. His keen and discriminating judgment was recognized by his colleagues and by the students, both of whom constantly sought his advice and counsel.

Although busily occupied in his profession, he gave freely of his time to public affairs. His overflowing energy and his powerful influence were always employed as constructive forces. He never criticized unless he had an alternative to offer that he considered an improvement. He did not pull down, except for the purpose of building a better structure. Uncompromising as an enemy, he was the staunchest and most loyal of friends, not one of whom, it may safely be said, ever appealed to him for help in vain.

When the World War broke out in 1914, Dr. White's interest in the cause of the Allies was at once aroused.

As Dr. White's biographer truly says, "Individual neutrality was to Dr. White a form of mental and moral cowardice. He held that no rational being has a right to plead ignorance, when knowledge is attainable, or to be indifferent to matters of right and wrong." In an effort to obtain knowledge in this matter, he at once began scanning the very voluminous literature put out by the warring nations, as well as that from other sources, that appeared to be reliable. The conflicting statements observed in this study seemed to be covered by twelve fundamental questions which he set down and proceeded to answer in order that he might himself reach reasonable conclusions. Those who had the privilege of reading this manuscript, urged Dr. White to publish the material in order that it might have a wider reading. This he did in December, 1914, under the title of *A Primer of the War for Americans*. So concisely and so authoritatively was the subject covered that the demand speedily exhausted three editions, and it was also translated in a number of foreign languages.

This was followed by *Germany and Democracy*, and later by a *Text Book of the War for Americans*, a volume of 500 pages, which appeared in May, 1915.

In this volume he included the matter contained in the pamphlet, and added such other important information as had accumulated in the interval between the two publications. This reference would scarcely be complete without adding that the proceeds of the sale of the pamphlet were given to the Belgium Relief Fund.

The final act of Dr. White's busy life was the organization of the University of Pennsylvania Unit of the American Ambulance Hospital, in Paris, which he accompanied to its post of duty in June, 1915, and he personally raised the money necessary to equip and transport the unit. It was during this trip that the first sign appeared of what proved to be a fatal illness.

A successful practitioner of surgery, an impressive writer, a teacher of the first rank, a public spirited citizen, filling many posts of responsibility and of honor, a wise counselor to a host of friends who depended on him in all emergencies, Dr. White exerted an influence in his community such as is rarely commanded by a single individual.

ALFRED C. WOOD.

CORRESPONDENCE

CHRONIC INTUSSUSCEPTION IN AN ADULT; DURATION FOUR MONTHS; RESECTION; RECOVERY

To the Editor: The patient, a rather poorly nourished Turkish peasant woman of about 25, was first seen by me on May 29, 1922. She had a well nourished and developed 9 months baby at the breast. As usual with this class of peasant it was impossible to obtain a very definite history.

Her chief complaint was severe abdominal pain, occurring without definite relation to meals, and persistent constipation. The onset had been gradual 4 months previous. Physical examination showed a well-developed but somewhat emaciated peasant woman of about 25. The scalp, eyes, ears, nose, and mouth were negative, except for slightly coated tongue. There was no enlargement of thyroid or cervical glands. Pulmonary resonance and breath sounds were normal. The heart was not enlarged; sounds were normal. The abdomen was somewhat distended, tympanitic, with moderate diffuse tenderness. Palpation set up violent peristalsis, which was painful and very strikingly visible, the abdomen being thrown into marked folds and ridges. There was no localized tenderness, no masses felt; liver and spleen not palpable. Extremities normal.

Patient was admitted to the Azariah Smith Memorial Hospital, Aintab, on May 31, with a preliminary diagnosis of chronic intestinal obstruction. As 5 days' treatment with cathartics and enemata failed to reduce the distention materially or lessen the pain, exploratory operation was decided upon.

Operation June 6. The abdomen was opened through a median incision, which was later extended from the umbilicus to the symphysis pubis. The cause of the obstruction was found to be an intussusception, ileocæcal, with a tumor mass in the cæcum about 6 centimeters in diameter. The ileum above the neck of the intussusception was moderately dilated and greatly thickened. Strands of firm white fibrin protruded from the neck. No attempt was made at reduction. The cæcum was mobilized and the mesentery of the ileum ligated with a chain ligature and freed from the gut for a distance of 3 centimeters above the neck. The portion of gut thus isolated was resected and the free ends of ileum and ascending colon inverted, after which an anastomosis was made, side to side. The abdomen was closed layer by layer with plain and chromic catgut and black silk. The operation lasted 2 hours, and during a large part of the time several feet of ileum remained outside the abdomen.

Postoperative course. Immediately after operation the patient received 500 cubic centimeters of saline solution by hypodermoclysis and this was repeated after 4 hours. The Murphy drip was also instituted immediately. Her bowels began to move within 24 hours after the operation and there was no distention or the slightest paralysis of the intestine at any time, in spite of the protracted evisceration during the operation. The wound healed by primary intention. On the eighth day after operation the line of intestinal suture was passed *in toto* as a slough by rectum. On the sixteenth day the patient's temperature rose to 101° and 2 days later it reached 103°. The cause was found in a localized area of consolidation in the left lower lobe posteriorly. For 13 days she ran an irregular temperature which was controlled with lysis. She was also troubled by a certain amount of diarrhœa, which was quite easily controlled with belladonna and opium. The patient left the hospital on the thirty-third day after operation, free from fever and without complaint.

Gross pathology of specimen. The specimen consists of an ileocæcal junction, with vermiform appendix *in situ*. The appendix appears normal. There is a tumor mass about 5 centimeters in diameter felt within the cæcum. A portion of the ileum has been invaginated into the cæcum. From the neck of the intussusception project several white strands of firm fibrin. On section the apex of the intussusception is found to consist of a round, annular tumor mass with a lumen passing through the center 0.5 centimeter in diameter. The distal portion of this tumor is gangrenous and sloughing and has a greenish color. On section it offers a uniform resistance to the knife, and shows a faintly striated uniform appearance. The outer surface of the intussusception shows many strands of fibrin but there are no adhesions. Total length of ileum involved about 30 centimeters.

Postoperative diagnosis. Chronic intussusception. Leiomyoma of small intestine.

The chief points of interest in this case are—

1. The duration of the intussusception without complete obstruction, possibly to be explained by the fact that the rigid annular tumor prevented complete closure of the lumen at the apex.

2. The rapidity with which intestinal peristalsis was re-established after operation, in spite of a long period of extensive evisceration. I have thought this might be attributed to the great hypertrophy of the muscular wall of the ileum above the obstruction.

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TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD FRIDAY, FEBRUARY 17, 1922, DR. CAREY CULBERTSON, PRESIDING

THE DIAGNOSTIC AND CLINICAL ASPECTS OF GONORRHŒAL SALPINGITIS

DR. HENRY SCHMITZ read a paper entitled: "The Diagnostic and Clinical Aspects of Gonorrhœal Salpingitis." (See p. 627.)

DISCUSSION

DR. CHANNING W. BARRETT: The essayist has given us a very distinct clinical picture of the gonococcus in the pelvis. It is scarcely ever that we have a discussion on the subject of infection without some person wandering away from the infection and discussing the reaction as the harmful thing. For instance, we hear it repeatedly said that if such and such a thing is not done or is done the endometritis will extend to be a salpingitis, and the salpingitis will extend to be a peritonitis, and a local peritonitis may extend to be a general peritonitis. There is no such thing as these extending of themselves. Their very nature is a limiting process. It has been said that the tendency is toward recovery. Yes, the process that is going on in the tube, the reaction against the infection, is a process tending toward recovery, but oftentimes so much damage is done that complete recovery cannot take place. Nowhere in the body, perhaps, is the protective nature so well shown as in the lengthening of the tube, the turning in of the tube, the thickening of the wall, the round cell infiltration, and the leucocytosis of the tube.

Then the question will arise, do we not very much overdo operative treatment, because we are repeatedly operating for inflammatory processes in the tubes. It is very evident in many of the protective processes that the primary nature of the process is protective, and yet with that process going on damage has taken place that will require a cleaning away of débris, and so we have the process to deal with both in the pelvis and in the tubes.

I would agree with all the essayist has said in regard to the diagnosis. I think it very frequently falls to our lot to make a probable diagnosis of gonococcus infection without any of these helps mentioned, without being able to make a smear showing the gonococcus, without being able to make a culture showing the gonococcus, without getting reactions, and yet we feel certain that there has been a gonococcus infection. For instance, when a young woman, perfectly well up to the time of marriage, menstruates the next day after marriage, and following that menstruation she develops a pelvic inflammation, we feel certain she has had a gonococcic infection, especially if she later develops extra-uterine pregnancy on one side, or a well-developed pus tube. Such things do not occur without gonococcic infection.

The history of these infections, as related by the essayist, reminds one of the discussion of Noeggerath which is found in the literature, in which he taught that a woman with these pelvic infections had a gonorrhœal husband; and well-known men in America in discussing the paper said that was not true; that it was not at all probable, but if there was any truth in it at all, it should not be allowed to become common knowledge because it would be the means of causing a great deal of disturbance among families. The thing they did not think at that time should be discussed in a medical society is discussed now very freely in the newspapers and in women's home journals. It should be known, of course. Women should know. A young man should know that to be indiscreet in his habits is going to lead to disease which is not going to be easily cured. When the wife becomes infected by the husband, in many cases the cure is not easily effected by the gynecologist, who knows that a great many of these cases are not easily cured, if cured at all. Many a man thinks he is cured of a gonococcic infection, and yet when he marries, his wife during the first year develops infection, a slow or perhaps more rapid reaction, and possibly the reaction is not great enough to keep her from having one child, but such a severe reaction may take place that she does not have another.

We have these infections in all their forms at the Cook County Hospital. We have patients coming in there with a history of infection dating back only a few days, and in some of these cases we are unable to find a mass in the pelvis. Once in a while we find one of them without a mass in the pelvis, although gonorrhœal infection is very evident from infection of Bartholin's glands, a violent urethritis, the discharge found in the cervix, and by the evidence of painful adnexa. There is no doubt of a gonococcic infection, and yet we may be inclined to think that patient may get along without an operation. We allow such a patient to go home sometimes with the injunction to return if she has a return of her trouble or it takes on renewed activity. Most of those pati-

ents sooner or later return with their tubes more noticeably enlarged. Upon operating we find there is evidence of much longer standing infection than the history would indicate. We have those cases which show no masses in the pelvis, whereas in others the masses may involve the bladder, the broad ligaments, the sigmoid, the cæcum, the appendix, the ureters, so that in one case after another nearly all of these viscera are involved.

The operative procedure we would carry out in all cases where the tubes are involved would be, at least, the removal of the tubes. In any period of my practice in dealing with an infected tube caused by the gonococcus I myself have not had any satisfaction from resection of a portion of the tube. If I have left any portion of the tube, I have had no results from the standpoint of childbirth, and usually these tubes have given trouble afterward. It goes without saying that incomplete removal of the tubes is not good practice. The tubes should be removed down into the uterus. I do not know that we can lay much stress upon absolutely leaving some portion of the tube in young women, because in many of these cases the infection is so great that the ovaries are markedly involved and are mere shells filled with pus and no ovarian tissue can be left. Yet I would lay great stress on the advisability of leaving an ovary if it is in condition to be left, and we should endeavor to leave an ovary showing even a fair condition. I would rather make it a habit to leave the uterus when it is in condition to be left, but in some cases the damage done is so great that it is not at all advisable to do so. I should not lay any great stress on leaving the cervix from the standpoint of giving a better vault for support because the structures do not get their support from the cervix; they get their support from the ligaments, and the ligaments can be utilized to hold up the vagina the same as they can be utilized to hold up the cervix.

There are those who lay strong claims in these days of pus tubes not needing operative procedure. I find in my experience with these cases in hospital and in private work, more particularly in the class of cases we have to deal with at the County Hospital, very little to give me encouragement that we can ever get along without the removal of the tubes. These patients are sick and sick until they have their tubes removed, and sometimes the removal of more important structures than the tubes is necessary. I do not hold out any great assurance that we are going to get 100 per cent good results after operative procedure in these cases. As I have said, a lot of damage has been done, and a patient may have anything from a binding down of viscera to absolute obstruction of the bowels following such conditions, and yet we know a large percentage of cases are greatly improved and some of them entirely cured by operative measures.

Dr. Curtis: Have you tried isolating these patients from the sources of infection, getting them away from their husbands or from those from whom they acquired the disease?

Dr. Barrett: There is something to be said on that score. It is very important to go back to the source of their infection and, if possible, try to stop it. I have seen patients who have had repeated attacks of gonorrhœa until they got divorces from their husbands, and then their infection cleared up and they got fairly well.

Dr. Arthur H. Curtis: In the management of these cases I wish to call attention to one or two points. In dispensary work, Dr. Supple and I have been much interested in the part played by vaginal douches in the production of tubal infection. We followed a great number of patients who had gonorrhœal infection of the external genitalia, ordering them not to use any douches, and, in a period of 5 years, we found scarcely a patient with diseased fallopian tubes among those who avoided douches. We are impressed with the importance of avoiding all forces from below which tend to carry the gonococcus through the cervical canal.

Another point of considerable interest to me in the study of salpingitis has been the laboratory evidence in these cases. I have found that very markedly thickened, chronically diseased tubes of large size almost always occur in patients who have had many attacks of salpingitis. A single attack of salpingitis is usually followed by a comparatively mild course, with only moderate changes in the tubes Patients who have been prostitutes or those subjected to repeated infections are particularly liable to have greatly thickened chronically diseased tubes.

If a patient has only had one attack of salpingitis and she can be isolated from the source of infection, we may ordinarily feel assured of a mild course, with the possibility of bearing children at a later date. It is reinfection from an external source, or from the infected lower genital tract, which tends to make the disease in these patients chronic with marked pathological changes and other serious after-results.

Dr. Barrett: I have noticed in cases in which much damage was done in the uterine portion of the tube that it became the size of a hickory nut or a walnut. I have noticed this particularly in women who have been prostitutes a great deal more than in other types of women. The outer end of the tube may not be involved very much, but there is more or less reaction in that part of the tube.

Dr. Curtis (resuming): Studies have been made of the bacteriology of the fallopian tubes in regard to the presence of the gonococcus, and it is almost universally accepted that the gonococcus does not live long. So far as I know, until recent times, cultures have not been made with modern methods. The entire tubes have not been examined for the presence of bacteria. We examined 192 tubes which were removed from patients with chronic salpingitis with the idea of determining whether or not the infection were persistent, and were unable to find the gonococcus in smears or in cultures from the entire tube in any patient who had been without fever or leucocytosis for a period of 2 weeks. To me this means that there is no such thing as chronic gonorrhœal

salpingitis; that what really happens is a recurrence of the infection of the tubes from some external or lower source, and the tube tends in itself to become free of infection after a short time.

THOMAS J. WATKINS: Vaginal incision and drainage for infected fallopian tubes is usually not good treatment. With palliative treatment, a general and localized immunity will occur. Vaginal incision and drainage in such cases is always an incomplete operation, as there are multiple pockets of pus and all of them will not be incised and drained. Incision and drainage will generally be followed by a secondary infection and may result in a septic sinus which would complicate an abdominal section. There are, however, exceptional cases where incision and drainage is good treatment. It seems to me that Dr. Schmitz's position relative to not disturbing the nerve and blood supply of the ovaries and his position in grafting ovaries are inconsistent, as in one case he is careful not to disturb the blood supply and in the other he entirely cuts off the blood supply. It has seemed to me that if there is any ovarian tissue sufficiently normal to be grafted, it is healthy enough to be left *in situ*. No one would question the fact that an ovary left *in situ* offers better opportunity for function than one that is transplanted. There is a strong suspicion that fragments of ovaries which have been left, in separation of adhesions and the like, have sustained menstruation in cases where the credit has been attributed to transplanted ovarian tissue.

I can see no excuse for complete hysterectomy in these cases, except in very exceptional instances. The cervical mucosa can be reamed out if necessary. The preservation of much of the broad ligaments intact is of much value to the pelvic floor.

Estimation of cures of gonorrhœa based upon microscopic examination of smears is of very little value except in acute cases. In the chronic cases gonococci will not be found in either instance.

Experience dictates that the most important palliative treatment is rest.

In my private practice gonorrhœal pus tubes have become extremely uncommon. I do not remember having operated upon one in the last year or two. The patients one sees in private practice are very different from those encountered in the County Hospital, the County cases having much more complicated and extensive pathology.

I have reported two cases of undoubted gonorrhœal infection of the tubes, where upon subsequent abdominal section the fallopian tubes appeared entirely normal. This justifies the statement that spontaneous recovery of gonorrhœal infected tubes occasionally occurs. Consequently, I believe that all cases should be given an opportunity to recover without operation, and that operation should be done only when positive indications dictate.

DR. IRVING F. STEIN: With regard to the question of diagnosis of cases of recurrent attacks at some time distant from the initial inflammatory attack, I have in mind a group of cases that were extremely difficult to diagnose because of the atypical symptoms and physical findings, and which were only properly diagnosed in some instances on the table, and in others only when the pathological report was received. In this connection I want to report two cases. One was a married woman, 27 years of age. Six years before her marriage she was living a rather loose life, and came to me on November 21, complaining of a severe pelvic pain on the left side associated with irregular bleeding, with the passage of clots, occasionally with dizziness and faintness. She had sensitiveness of the breasts, frequent urination without pain or burning. Her last regular menstrual period was 2 months before, and the bleeding since that time was scant, was scarcely more than spotting and associated with severe pelvic pain. The spots were bright red and often with clots. Three and a half years ago she was operated upon for ectopic pregnancy. She had never missed a period from the time of the operation until the present time, when she missed 2 months. At the time she presented herself she said she felt the same type of pain as she had with her ectopic pregnancy. She had dizzy spells, fainting spells, and spotting. There was no history of any acute inflammatory process, except in the convalescence from operation, which was rather protracted and febrile; she was in the hospital over 3 weeks after her ectopic pregnancy. At the time of the examination there were no color changes in the mucous membrane suggestive of pregnancy, but her uterus was slightly larger and softer than normal and somewhat irregular. She had tenderness on both sides but no mass was palpable. There was no bleeding at the time she presented herself. She was told to keep in touch with me so as to be under observation. On December 5, 2 weeks later, she returned for examination; she again emphasized the point that she was very fearful of another ectopic. During almost a month she had been having repeated attacks of pain with spotting and fainting. At this time I advised her to go into the hospital for examination under an anæsthetic, which she did, and under the anæsthetic nothing was palpable in the adnexa, and the uterus seemed a little enlarged, soft, and slightly irregular. There was no bleeding at the time, and I again sent her home in order that she might be kept under observation. Three days later, at 2 a.m. she was bleeding rather profusely with clots; she had severe pelvic pain in the right lower abdomen, and had vomited at the onset and felt very faint. At this time her temperature was 99°, pulse 108. She was sent to the hospital, and on admission her temperature was 99.4°; hæmoglobin, 75 per cent; white count, 14,500. Laparotomy disclosed the pelvis full of adhesions, the omentum plastered over the uterus, the left adnexa missing; right tube was enlarged to about the size of the index finger and closed, club-shaped, black in color, very soft and found to contain clots. Upon opening the tube a blood clot was found but there was no evidence of any ectopic pregnancy.

The pathological report of this case was as follows: tube contained a quantity of clotted blood, but no

evidence of chorionic tissue; mucosa pale, and microscopically the stroma and villi of the tube markedly œdematous and moderately infiltrated with leucocytes; vessels congested. The diagnosis was acute catarrhal salpingitis. This patient was without fever, and the attack simulated the picture of a typical ectopic. She made an afebrile recovery, and went home on the tenth day.

The other patient was a young woman, age 22, whom I saw October 27, 1921, complaining of more or less continuous bleeding for 2 weeks. She was married 5 years ago. A few months after marriage, there was an attempt at abortion of an early pregnancy. This was unsuccessful and the fœtus was carried to 6 months. After being examined by a woman physician she began to bleed and the membranes ruptured. The first time I saw her was at the Michael Reese Hospital, when she was in labor, and I delivered her of a 6 months' fœtus about 26 hours after the rupture of the membranes. She had an afebrile puerperium, having no temperature over 99.6°. Two months later she returned with an acute pelvic peritonitis, was treated conservatively in the gynecological department, and at the end of 2 weeks' time she was discharged, but was kept under observation. At that time her hæmoglobin was 70 per cent; white count 12,000. The diagnosis on her discharge from the hospital, made by Dr. Lackner, was parametritis, with marked infiltration on the left side. She had practically no trouble from this time on, that is, in 1916, until October, 1921. During that time she was singing and dancing in cabarets. She had very little sensitiveness and no history of pain. She had regular menstruation until 2 weeks before she came to the office, when she complained of more or less continuous bleeding. At the time she had a retroverted uterus, bound down, without any possible recognition of any adnexal tumor. She continued to bleed for a few days, and then, on October 30, she had a convulsion at 8 o'clock in the morning. She was brought into the hospital an hour later, and it was found she had a hæmoglobin of 40; red blood count, 1,600,000; white count, 6,000; temperature, 101°; pulse, 132, respiration, 34. Laparotomy was decided upon and done at once. The peritoneal cavity was found free of blood; the tubes and all the pelvic structures were extremely pale; the tubes bound down in the typical manner described by Dr. Schmitz for the gonorrhœal type of inflammation, by very tough, fibrous adhesions, and were also enlarged to about the size of the index finger or thumb and were closed. A double salpingectomy and a partial oophorectomy was done, with excision of the tubes from the cornua. The pathological diagnosis was bilateral interstitial salpingitis, unilateral acute purulent salpingitis, bilateral chronic adhesive salpingo-oophoritis and cystic corpus luteum of the ovary.

My reason for detailing these two cases is that we find in cases of so-called acute exacerbation of the gonorrhœal tube probably are infection of gonorrhœa, but with a clinical picture that is distinctly atypical. Both of these cases were thought to be ectopic pregnancies, and the diagnoses were made only on the table, or when the pathological report was returned.

Dr. Carey Culbertson: Dr. Watkins referred to the frequency of pus tubes at the Cook County Hospital. They comprise the commonest condition we have in the gynecological ward in that institution.

I have attempted to tabulate my cases of salpingitis or tubal infection of all sorts and have secured much interesting data. The pathology as described by Dr. Schmitz is I think quite accurate. If I recall, however, he did not bring out the node formation in the isthmus of the tube, probably because he has found it in other than the gonorrhœal tube. In 283 cases of my series, salpingitis nodosa was present in both tubes in 10 per cent and in one tube in 12 per cent.

Again, as regards the coincidence of pyosalpinx and the lower lesions I have been surprised to see how rarely we find associated gross pathology in the Bartholin glands. The urethra and Skene's ducts seem to be rather frequently involved, but the paravaginal glands very seldom. In my series of 518 cases, both glands were involved but three times, and a single gland four times, and in two other cases the glands were cystic and did not contain pus. On the other hand, the majority of cases wherein the Bartholin glands are involved are free from salpingitis without evidence of infection above the vaginal vault.

As regards the conclusions of the essayist, I am in general agreement. Rest in bed in the acute and subacute stages is without any question the important thing, and this should be secured in the hospital where the patient is kept away from the source of infection.

As to the ovarian function, I am a strong advocate of conservation of the ovaries. In the 518 cases referred to, bilateral oophorectomy was necessary 85 times; and in only 9 of these cases did I find tissue suitable for transplantation.

There can be no hard and fast rule laid down for ovarian conservation; this rule must be very elastic and readily adaptable to each individual case.

Drainage through the posterior vaginal vault is of definite value where mass formation is extensive, where there is marked bulging either posteriorly or laterally. In the ordinary case of pus tube I do not think such drainage is of much value. I drain these cases not only to get rid of the pus but to relieve the patient of the immediate suffering from pressure and from pain. I do not think it makes much difference in her recovery or as to the length of time it takes for her to become afebrile, but it relieves her of her suffering for the time being.

As to the disposition of the uterus, I have discussed this subject recently, and while I think it is of value to preserve menstruation in young women, if possible, I do not think it is necessary to preserve the entire uterus. Where the uterus is definitely pathological and chronically changed, it should be removed. I am not afraid of taking the cervix out

because of shortening the vagina, since where the round ligaments are stitched into the vaginal vault a deep vagina is left. On the other hand, I agree with Dr. Watkins that the pelvic floor is somewhat weakened by the removal of the cervix.

RADIUM VERSUS OPERATIVE TREATMENT OF FIBROIDS

DR. HEANEY discussed the clinical results of radium and operative treatment of fibroids. (See p. 625.)

DISCUSSION

DR. JOSEPH L. BAER: I am sorry the essayist did not go into the systemic disturbances following either operation or the use of radium and X-ray. I should have been interested in what his conclusions were regarding that phase of the subject, since so much attention is being paid to endocrine activities in all fields.

In reading the literature and in observing both the operative procedures and the X-ray and radium treatment at the Michael Reese Hospital, certain effects on the system have stood out in my mind, more particularly the psychic equilibrium of the patient. It seems to me, there is a definite consensus of opinion that the psychic equilibrium of the patient is much less disturbed following some form of radiation than following operative interference. Whether the explanation is the consciousness of mutilation on part of the patient, or an actual surgical trauma of the genital nerves, I do not know. Secondly, the sexual function and libido of the patient are much less disturbed following radiation than following surgical interference.

DR. SCHMITZ: Do you mean radium or X-ray?

DR. BAER: Either. In the third place adiposity seems to be more noticeable following operative intervention than following radiation.

DR. HEANEY: Are you comparing the removal of the ovaries with radiation?

DR. BAER: Yes. The only systemic effect that seems to act indifferently, according to both methods of treatment and according to the literature, is the occurrence of flashes and hyperidrosis. The results seem about fifty-fifty in these two phenomena.

One very interesting disadvantage of the X-ray which I personally have never observed but which is described repeatedly is a loss of memory either temporarily or permanently. I should be interested if Dr. Heaney has any remarks along the line of systemic disturbances.

DR. HENRY SCHMITZ: I wish to mention the contra-indications we have followed in our work. In the first place, if a fibroid is complicated with any other pathology, it is not subjected to radiation. In the second place, if a fibroid does not cause any symptom, it does not indicate any treatment at all. In the third place, fibroids which cause pressure symptoms or degenerative changes, are never treated by radiations. In the fourth place, cervical, submucous and subserous fibroids are never subjected to radiation. A subserous fibroid does not cause one of the symptoms for which we treat these patients, that is, hæmorrhage; while submucous fibroids are accompanied by marked changes in the endometrium, and in these the use of radium is contra-indicated. Fibroids which are larger than a man's fist and situated mid-way under the symphysis pubis and umbilicus are not subjected to radium. This means that there are only a few cases left which are strictly intramural and of small size that are suitable for radium treatment. I find in my work that fully 40 per cent of fibroids are susceptible to radiation and can be treated with success.

The question arises whether we shall treat these patients with radium or X-ray. By that I mean to say, is there any advantage in using one or the other? It has been my firm conviction, and I have substantiated this by microscopic examination of ovaries which have been removed from patients previously treated with radium, that the ovary shows hardly any reaction at all from the radiation. On the other hand, the radium radiation is entirely spent on the endometrium and the substance of the uterus alone, while the X-ray application necessarily attempts to bring about the cessation of ovulation or, in other words, a premature menopause. In the other 60 per cent of cases, hysterectomy or myomectomy is done as indicated. There is no doubt that operative procedures are very safe, especially if we operate on a class of patients who are intelligent and can take care of themselves afterward. One should take into consideration the ease with which a patient recovers from radium treatment and the difficulty at times of recovering from an operation. We prefer radiation where it is indicated.

The tabulation of the results of the work of Dr. Heaney is certainly very elaborate and minute and is very interesting, and I congratulate Dr. Heaney on his success in this work.

DR. HEANEY: Dr. Schmitz mentioned that histologic examination of the ovaries after radiation with radium showed very little change. The proof of the effect of the action on the ovaries would not have to depend upon microscopic examination when we have definite hot and cold flashes. The patient does not menstruate, and if she has hot and cold flashes her ovaries are disturbed whether the microscope shows it or not.

DR. SCHMITZ: Are these disturbances less frequently seen under radium radiations than under X-ray radiations?

DR. HEANEY (closing): So far as the psychic effect is concerned between radium and operation, I should say the degree of psychic disturbance is a hard thing to measure. If a patient does not menstruate and has hot and cold flashes, those are the best indices as to whether a patient is having cessation of ovarian function or not. The disturbances are just as severe in a patient who has had her ovaries removed as they are when radiation is resorted to. There is no difference except sometimes a patient

may have had sufficient radiation to produce absolute amenorrhœa. If she does not have absolute amenorrhœa, it is delayed. But in operating these patients are liable to get well more quickly than with radiation, provided amenorrhœa is produced.

So far as loss of memory and psychic disturbances are concerned after radiation, I think one patient I have in mind got psychic disturbances rather than physiological results of the operation or radiation, because psychic disturbances occur anyway in patients of such temperament. The psychic disturbances may be brought about because she could not go to California, or because she could not get a new automobile, or by any psychic jar, and it is not due to radium in one case and to operation in the other. In this patient, who had a temperature of 105° and who was very sick for 5 days, with great care I removed enough of the uterus so that menstruation would continue. That patient was 38 years of age. She had a fibroid well above the umbilicus which protruded like an advanced pregnancy. She wanted to get married and wanted to know the results beforehand. I told her everything I could regarding her condition; that she had a fibroid, was bleeding, and would not likely become pregnant. If I had radiated her, I would not have had psychic disturbance. While she is not exactly crazy, she is very selfish and wished she never had an operation. She is menstruating, but she will not get married because she can not have children. If I had put radium in the uterus and talked about the result of it and told her I had not removed any of the uterus at all, so far as having a child is concerned, she would not be any different than she was before; it would not have disturbed her psychically, but because I removed a portion of the uterus she was disturbed. That patient is having psychic disturbance because of the operation, and she would not have had it if radium had been used. It is not a physiological result. It would be the same as if some other condition occurred over which she had no control.

In regard to loss of memory, I received a letter from an old maid, a school teacher, who had a massive fibroid tumor on which I operated. She has a drawing sensation on the side of the face and is afraid she is going to have paralysis as a result of that operation. This would not have occurred if I had given her radium. She would not have been so nervously upset. When we know that a large number of patients is so "crazy" over financial matters, I do not think we should attach so much importance to psychic disturbances after operation or after radiation as we are inclined to do. A simple difference in hospital bills sometimes will count for much.

CHICAGO GYNECOLOGICAL SOCIETY

Regular Meeting Held March 17, 1922, Dr. W. C. Danforth, Presiding

ROUND-CELL SARCOMA OF PUBES AND ANTERIOR FORNIX IN BABE OF SEVEN MONTHS: CARCINOMA OF BREAST IN PATIENT OF TWENTY-ONE

Dr. Mark T. Goldstine: The mother of a 7 months old girl, well above the average weight, brought in the child because she had noticed a growth protruding slightly from the vagina. When I saw the child the growth was about 1.5 inches long and 0.75 inch thick, to the right of the urethra, pushing the urethra over slightly. The mucous membrane over the top was very thin. On handling, the growth seemed hard and fairly firm. It did not bleed easily when touched. The tumor apparently had grown rather rapidly in a month, for the mother had noticed it first when the child was 6 months old. From the previous history and from seeing similar cases abroad, I made a diagnosis of sarcoma and advised the removal of this growth, with subsequent radium treatment. I operated upon the child and found removal of the growth a rather tedious undertaking. By inserting a metal catheter I was able to clean up the urethra and the area along the ramus of the pubes. I did not find the growth attached to the bone. It seemed rather to rise from the pubes and the anterior right fornix. The microscope confirmed the diagnosis of round-cell sarcoma. I introduced 100 milligrams of radium and left it in for 12 hours. What the ultimate result will be remains to be seen. The prognosis, of course, is bad.

The next case is unique in that the patient was a girl of 21, married for 3 months, who had noticed a small nodule in the right breast a month previous to my seeing her. As is my custom in all breast cases, except perhaps in the case of a nursing mother, I urged removal. The growth proved to be a carcinoma of the breast. The question arose, because the nodule came out easily, whether a radical removal of the breast and glands in the axilla was justifiable. After some argument I had my way and did a radical operation, the same as though it had been a more advanced case.

Dr. Channing W. Barrett addressed the society on: "Rectal Complications in Gynecology."

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD APRIL 21, 1922, DR. W. C. DANFORTH, PRESIDING

TECHNIQUE IN CYSTS AND ABSCESSES OF BARTHOLIN'S GLANDS: TECHNIQUE IN PROLAPSE OF FEMALE URETHRAL MUCOUS MEMBRANE

DR. THOMAS J. WATKINS: Operations for these conditions are made much easier by making a free longitudinal incision through the vaginal surface for the entire length of the cyst. The sac is then everted as one everts a sebaceous cyst after incising it. The lining of the cyst is then either enucleated by blunt dissection or denuded in strips. The advantages of this procedure over the usual method of excision are—much time is saved, much less bleeding occurs, less traumatism results, and less swelling and pain follows.

The note on technique described below is for use in the peculiar type of prolapse of the mucous membrane, which is similar in form to prolapse of the rectal mucous membrane. The feature in technique consists in making a longitudinal incision through the vaginal mucous membrane an inch or more in length down to the urethral body. The urethral body is now rendered mobile by increased dissection, if necessary, to an extent of allowing the prolapsed membrane to be easily replaced by grasping the urethral body by a tissue forcep. The urethral body is now fixed by careful suturing. This procedure has all the advantages of the Emmet operation and the additional advantage that a urethral fistula is avoided.

SO-CALLED CATGUT INFECTIONS

DR. JOSEPH B. DELEE: Every little while one hears of some hospital having a run of catgut infections, or one is surprised at a good, clean case suppurating or developing a more or less serious form of infection. I have always felt our little errors of technique were responsible for the so-called catgut infections, and also sometimes for the graver forms of infection.

For many years I have thought we trusted too much to one or two layers of sheeting to protect the sterile field from contamination, so in order to prove the point I have had a piece of ordinary operating gown magnified 950 diameters and have pasted thereon some photomicrographs of pure cultures of four of the most common infective agents. We have seen many times after a dusty, non-sterile table is bedecked with a sheet that table handled with confidence; we have seen the operator put his sterile gloves under his arms; help to lift the patient (through a sterile sheet), the instruments are handled with one layer of towel between the non-sterile fingers and instrument, trusting one layer of cloth to delimit the infection. We have seen sterile instruments and catgut laid on a table protected (?) with one or two layers of towel. Sometimes a sharp needle will go through the cloth to the table underneath. If the cloth is wet capillarity will draw the germs through.

I have had this cloth made which magnified a piece of surgeon's operating gown 950 diameters, and here we have photomicrographs of various bacteria. To say that I was surprised myself when I saw this chart is putting it mildly. These photomicrographs were made by Mr. Frank Harmon, so that you can rely on their accuracy. The piece of surgeon's operating gown was new and was magnified 950 diameters. Here (demonstrating) is a culture of the staphylococcus albus. There are here several thousand staphylococci. Here is a culture of the tetanus bacillus. There are 60 or 70 in this colony. You also see here colon bacilli and streptococci. There is room for several hundred thousands of these bacteria to march abreast between the openings of the fibers of this gown. The thickness of the gown is about one-half the size shown, so that you see the distance the bacteria have to travel from the infective surface to the sterile field is a considerable one for germs to travel. But, when we remember there are air currents constantly going through these interstices of the fibers, and how these clothes are rubbed over the dusty surfaces, it is easy, under such circumstances, to see how contamination occurs. We know that a rubber glove does not always protect the hand from the odor acquired from examining a cancer, and occasionally after the use of lysol the hand will smell of lysol even if there is no perforation in the glove. I will have Mr. Harmon take a glove and see if there are any openings in it. Some years ago this question arose, and I took a sterile glove and put a culture bacillus pyocyaneous in it and inserted the glove in sterile bouillon, and there was no growth, so that we proved these bacteria do not go through the rubber glove.

DR. WATKINS: I would like to ask Dr. DeLee what the plan was of making these photomicrographs.

DR. DELEE: The photomicrograph of the cloth was made by Mr. Harmon and he magnified it about 90 times. He makes photomicrographs of silks and other materials. I simply took the photograph which he supplied me to a photographer and told him to magnify it 10 diameters which brought it up to the size you see, namely about 930 diameters, and the bacteria were also magnified 950 times. I believe what I have shown will explain many of the cases of occult infections that arise in hospitals.

DR. W. A. NEWMAN DORLAND read a paper entitled "The Youngest Tubal Pregnancy to Date."

PROBABLE TUBAL PREGNANCY

DR. CAREY CULBERTSON: Without discussing this very interesting and valuable report of Dr. Dorland's, I wish merely to show a specimen which I recovered at my clinic at the Cook County Hospital this morning.

The specimen is that of a right fallopian tube somewhat kinked and thickened but with a patent abdominal ostium. About 0.5 centimeter from its uterine end is a small area the size of a pea which closely suggests an ectopic pregnancy. The patient was a young woman 26 years of age, who six years ago had a spontaneous abortion in the early weeks. This passed uneventfully without subsequent curettage. She has been married 5 years. She has menstruated every 30 days for 5 days each time, moderately without dysmenorrhœa. She came into the hospital complaining of pain in the lower abdomen that had been going on for 2 years, and with heavy bearing down sensations, with pressure in the lumbosacral region. There have been no acute attacks of pain which required her to go to bed, associated with nausea and vomiting or with chills and fever. She has had no sharp, colic-like pains of any sort. Her last period was the 16th of last March. She should have menstruated therefore on the 15th of this month, but she did not. When I examined her yesterday for the first time, I found the uterus in retroflexion, and while it did not appear to be fixed, yet it was not as free as a simple retroflexed uterus should be. The appendages were prolapsed. Owing to the fact that she has missed menstruating this month and had been regular, I hesitated about ordering her up for operation. However, I had her brought up prepared for operation with the intention of examining her first under gas anæsthesia. This was done. The uterus appeared to be very slightly enlarged and again under anæsthesia I was unable to elevate it. Having in mind that if there were adhesions there were probably kinked tubes, and that we might have an early ectopic pregnancy, I decided to operate. The uterus was adherent in retroflexion by dense old bands, the appendages were prolapsed and the tubes kinked and thickened but patent. The left tube was fairly normal when freed but the right contained the small dark area in its isthmus which I have mentioned. The left ovary contained a corpus luteum 1.5 centimeters in diameter; the right ovary was quite normal. The uterus was soft and enlarged, about as an early pregnant one should be. Its fundus was free. After breaking up the adhesions the right tube was extirpated and the uterine ligaments shortened. This specimen may not prove to be one of ectopic pregnancy. If it should, however, it will represent gestation but 29 days after the cessation of menstruation.

SHORT UMBILICAL CORD

DR. OTTO H. ROHRLACK read an inaugural thesis entitled "Short Umbilical Cord." (See p. 632.)

DISCUSSION

DR. E. L. CORNELL: It seems to me that Dr. Rohrlack is to be congratulated on noticing or in having seen so many short cords in a hundred cases.

I wish to call attention to the value of the head stethoscope in the delivery in short cord cases. By means of the head stethoscope one is able to detect changes in the fœtal heart rate, and he is able to listen to the fœtal heart rate at frequent intervals so that if any outward signs appear, such as meconium, he can interfere much sooner than he could before the introduction of the head stethoscope.

DR. ROHRLACK (closing): The frequency of the occurrence of a short cord was a revelation to us in this series of cases. However, since this paper was written there has been an increase in the frequency, from 38 to 44 per cent of coils about the neck, 22 in 50 labors. All these cases which had the cord about the neck gave definite symptoms relative to the passages, the passenger, or forces. It would seem that the percentage is not too high. It has apparently increased in frequency. The percentage of frequency is based on a comparatively few cases, and as these cases accumulate it may be found that the estimate is too high. I do not find anything in the literature on actually short cords except regarding those that were exceedingly short. We should pay a little more attention in the observation of our cases, to the forces, the passages, especially to the heart of the baby in the first, and certainly in the second stage of labor, and by so doing, I believe that one may establish the presence of a shortened cord in the majority of cases. Not only, in some cases, can a short cord be diagnosed as being about the neck, but one may with a considerable degree of probability diagnose which way it is wrapped around the neck. This is possible to determine by the way the head is influenced in its rotation by the direction of the pull of the cord.

DR. HEWITT: I would like to ask Dr. Rohrlack if he has noticed in these cases any cerebral hæmorrhage in the babies.

DR. ROHRLACK: There has been none in our series. There has been considerable asphyxia in some of the babies. In this series none of the babies died: but only two nights ago a baby which had the cord about the neck was born with an asphyxia pallida. The heart tones became very slow. It was a spontaneous delivery. The child died 8 hours afterward. I do not believe the death was due to cerebral hæmorrhage but to asphyxia.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS ON SURGERY

THERE is probably no subject upon which there is more diversity of opinion than upon the treatment of certain non-malignant affections of the stomach. The amount of work that has been done and the literature written is enormous, in fact so voluminous that it is beyond the comprehension of the average man. It is, therefore, with much benefit that we are offered a little volume by Cumston and Patry.[1] As Moynihan says in his introduction to this volume: "There are wide diversions of opinion between physicians and surgeons concerning the need for surgical treatment in non-malignant diseases of the stomach. Neither the physician nor the surgeon undertakes adventures into the territory of the other with that frequency which would be of benefit to both, and so far as details of surgical treatment are concerned there is nothing approaching unanimity among surgeons whose experience is considerable. A fresh and intimate study of the whole subject is urgently needed, and consequently a work such as this written by surgeons who have devoted great talents and a wealth of care to a close study of these affections and their treatment will be eagerly welcomed in every land."

The authors after discussing various surgical procedures on the stomach, divide their text into the treatment of the following conditions: stenosis, ulcers, gastric dystopia and dilatation, nervous dyspepsia, disturbances of the gastric secretions, tuberculosis, syphilis, and traumatic lesions of the stomach. In brief, they advocate gastro-enterostomy for benign stenosis of the pylorus, and for infantile hyperpyloric stenosis they advocate the method of Strauss in preference to the Rammsted operation. For the acute ulcer medical treatment is recommended; for the more or less chronic ulcer a month's medical treatment, and then the question is debated whether further medical treatment should be given or surgery should be resorted to. For the definitely chronic ulcer, surgery is recommended without reserve.

The type of treatment seems to be operation by Billroth II method since most of the ulcers are located in the pylorus. They seem to favor the removal of the ulcer-bearing area for various reasons: to prevent perforation, to prevent obstruction, to do away with possibly malignant areas, and to restore normal physiological function.

Hæmorrhage of the stomach is divided into three classes: the acute fulminating, the severe recurring, and chronic hæmorrhage. It seems to be the consensus of opinion that the fulminating hæmorrhage should be let alone, as most of them cease with complete rest of the stomach. The severe recurring hæmorrhage, during the time of the hæmorrhage, should be let alone, but deserves surgery as soon as the patient's general condition warrants. Surgical procedure is then practically the same as for the third type, which is the treatment of chronic ulcer. The authors are most emphatic in stating that the various gastric dystopias, dyspepsia, and various disturbances of secretions should fall to the hands of the internist for medical treatment.

It can thus be seen that this little volume is decidedly a résumé of the ideas of today regarding surgery of non-malignant diseases of the stomach. A reason is given for every procedure and why it is accepted as the most logical course of treatment. There is probably no volume of its size which offers such an abundance of material on this type of diseases of the stomach, and it is, therefore, with much pleasure that it is recommended to the surgical as well as the medical profession. J. A. WOLFER.

UNDER the very capable editorship of Mrs. M. H. Mellish appear the papers from the Mayo Foundation for Medical Education and Research and the Medical School of the University of Minnesota.[2] This collection of papers comprises the articles prepared during the years 1915–20, inclusive.

It is intended that at stated intervals these papers shall appear as a collected volume for the benefit of the profession at large. The present edition, which is Volume I, consists of many rather unusual contributions, many of them dealing with fundamental principles based upon experiments on lower animals. These are of necessity interesting to research workers and to those clinicians especially interested in the subject at hand. Unfortunately, many of the articles appear only as abstracts, which may be disappointing to many who are interested.

Several papers in this volume deserve special attention. Notably among these are Harrington on "The Effect on the Kidney of Various Surgical Procedures on the Blood Supply, Capsules, and on

[1] THE SURGICAL TREATMENT OF NON-MALIGNANT AFFECTIONS OF THE STOMACH. By Charles Green Cumston, M.D., and Georges Patry, M.D. With introduction by Sir Berkeley G. A. Moynihan, K.C.M.G., C.B., M.S. London: William Heinemann, Ltd., 1922.

[2] PAPERS FROM THE MAYO FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH AND THE MEDICAL SCHOOL, vol. i, 1915–1916. Philadelphia and London: W. B. Saunders Co., 1921.

the Ureters"; also, the article by Bumpus on "Carcinoma of the Prostate." Hedblom gives a very comprehensive description of treatment of "Chronic Empyema." This article is especially interesting since the surgical profession is constantly encountering cases of empyema which become increasingly difficult to treat and cure. Although the author has not brought out anything particularly new, he has emphasized many things which the average man fails to comprehend.

We have heard much in the past on vaccine therapy. Many questions have been raised as to the peculiar and specific action of vaccine, especially in relation to the injection of foreign proteins. The article by Hermann on "The Liberation of Antibodies in the Injection of Foreign Proteins" is in consequence most interesting, and for those who are unfamiliar with the subject it is of intense interest. Also, the article by Benton on "Nitrogen Metabolism of Bacteria" is of special merit.

Withal, this volume consists of an enormous amount of material, and in spite of the fact that many articles are abstracted, the abstracts usually state in brief the essentials of the article and in this way really accomplish their purpose. It is interesting to note the enormous amount of research work going on in the Institution, which must in the end bring about much good. J. A. WOLFER.

MANY men who have traveled and studied abroad have visited the wonderful clinic at Berne. Probably in no continental European clinic is there such a wealth of material which is studied with such precision as at the Berne clinic.

DeQuervain, the successor to Kocher, has for many years been a shining light in the European surgical profession. Those who have seen him work cannot help but respect him very profoundly. It is, indeed, fortunate tnat we are again in receipt of a new edition of his work on surgical diagnosis.[1] This offers such a striking contrast to the usual works on surgical diagnosis that to read it becomes a very pleasing opportunity.

The author has accepted a very novel and original method and instead of the usual stereotyped form of naming a disease and giving the clinical symptoms and physical findings, he takes up the subject matter by regions, detailing certain symptoms and findings and what pathological conditions produce them. Consequently, there is more attention paid to accurate and repeated physical findings and to a detailed clinical history than is usually the case. One is constantly impressed with the fact that in order to make a correct diagnosis one must have an absolutely correct history of a condition, and that one's physical findings must be very carefully made. Many general findings are given much attention, and it is very interesting to read the paragraph concerning the condition of the tongue and the mouth in acute intra-abdominal infection. So little stress is laid upon these findings in American literature that it is never brought to the average student's attention.

This volume is very extensively illustrated and the text is given in the author's own characteristic way. To the reviewer's mind there is probably no other single volume so pregnant with sound facts and so helpful not only to the student and general practitioner but to the experienced surgeon.

J. A. WOLFER.

THE spleen, which W. H. Mayo in his characteristic way designates as the "organ of romance" has been a source of great speculation for many years and even today continues to be a great puzzle. Many men have devoted much time to the study of the spleen and its functions, and much experimental work has been done, but withal it must be said very little has been discovered. So it is with interest that the little book of Moynihan[2] is received.

Truly there is no man more fitted to give a discussion on this questionable organ than the great Leeds surgeon. There is no man who stands more squarely upon two feet and who allows his mind so little fantastic play as this great surgeon, and consequently anything that comes from his pen should be read and reverenced.

After a rather graphic description of the known anatomical and physiological characteristics of the spleen, the author discusses a series of diseases in which the spleen is known to be involved. Each of these chapters is accompanied by schematic drawings of the anatomical and physiological relations between the liver, spleen, and bone marrow. These drawings very materially assist the reader in grasping a thorough conception of the text. The author does not claim that he has done any particularly original work, but has chosen from the enormous amount of experimental work and from clinical observations of prominent men of the world, as well as his own experience, those data which to him seem logical and sound. To extract from the world's literature the meat and leave that which is unsound is truly a great task. The result depends entirely upon the caliber of the mind and the judgment of the writer.

The chapter on cirrhosis of the liver is very interesting, as it does away with a great deal of confusion of the present day regarding the two types of cirrhosis of the liver.

The little volume is truly an evening's entertainment, and much benefit can be derived from its perusal. J. A. WOLFER.

IT is a great pleasure again to have placed before us the *Collected Papers of the Mayo Clinic*.[3] This volume appears annually and for the general

[1] CLINICAL SURGICAL DIAGNOSIS, FOR STUDENTS AND PRACTITIONERS. By F. de Quervain. 3d English ed. Translated from 7th ed. by J. Showman, M.D. New York: William Wood & Co., 1921.

[2] ESSAYS ON SURGICAL SUBJECTS. By Sir Berkeley Moynihan, K.C., M.G., C. B. Philadelphia and London: W. B. Saunders Co., 1921.

[3] COLLECTED PAPERS OF THE MAYO CLINIC, vol. xiii. Edited by Mrs. M. H. Mellish. Philadelphia and London: W. B. Saunders Company, 1922.

medical profession and especially the surgical profession, it is a source of the greatest benefit and pleasure.

It is interesting to note that in the present volume, which is the papers of 1921, there are 76 contributors to 117 individual papers. Several of the articles are sequelæ to papers which have appeared in previous volumes. It is very difficult to express anything more than a general opinion of this volume. The work is so comprehensive and covers practically every region of the body in such a masterly and thorough fashion that any review is practically impossible.

It might be interesting to state that work dealing with the bacterial causes of many chronic and obscure diseases is especially dealt with by Rosenow and others. Such diseases as iritis; hiccups; myositis; kidney, heart, and lung infections, have been studied with the greatest care in co-relation with many animal experiments, and the results appear so conclusive and striking that one is forced to accept them in spite of the fact that many European surgeons and research workers look upon the opinions with suspicion.

Gastric surgery, which we all know has found its greatest exponents in Rochester, continues to receive its merited attention. The report on the diagnostic and therapeutic aspects and sequelæ of gastric surgery based on 6400 operations is of the greatest interest. Truly we must observe with the greatest admiration and respect any observations based upon such a large series of cases, and especially so since these cases have been studied by the best of men who are equipped in every way for diagnosis and treatment.

The article by Wilson on malignant tumors of the thyroid deserves special attention. His classifications and studies are, indeed, interesting and are probably the most comprehensive that we have in American literature today. It is difficult not to be attracted to any article which appears in this volume, and countless pages could be written in admiration and respect. Most of these papers have been read before some society or have appeared in some journal, but for those of us who are great admirers of the work of the Mayo Clinic, it is a pleasure to have these papers collected in this form, printed on the best of paper, in clear type, and ready for reference. J. A. WOLFER.

THE uninterrupted search for more effective methods of controlling malignant disease is reflected in three monographs recently published: *Diathermy* by Cumberbatch,[1] *Radium Therapy* by Simpson,[2] and *Radiation Therapy* by Kroenig and Friedrich.[3]

[1] DIATHERMY: ITS PRODUCTION AND USES IN MEDICINE AND SURGERY. By Elkin P. Cumberbatch, M.A., B.M. (Oxon.), M.R.C.P., St. Louis: C. V. Mosby Company, 1921.

[2] RADIUM THERAPY. By Frank Edward Simpson, A.B., M.D. St. Louis: C. V. Mosby Company, 1922.

[3] THE PRINCIPLES OF PHYSICS AND BIOLOGY OF RADIATION THERAPY. By Bernhard Kroenig and Dr. Walter Friedrich. Authorized translation by Henry Schmitz, M.D., New York: Rebman Company, 1922.

The first is written in an admirably conservative manner and without claiming unqualified success for the method of treatment advocated. It loses some of its effectiveness by a somewhat prolonged description of various instruments for producing diathermy, and of its physiological effects. To the best of our knowledge, the effects of diathermy are simply the result of heating of the tissues. Its peculiar advantage lies in the fact that by reason of the high frequency current used, stimulation and electrolysis of the body tissues are avoided, and the production of heat in the tissues which transmit the current is the sole effect. The intensity of the heat produced and the area affected may be controlled by the size of the electrodes and the strength and duration of the current.

An account of the treatment of neuritis and gonococcal joint infection, and of the removal of malignant tumors of the skin and of the mucous membrane about the mouth and throat is the most suggestive portion of the book. Although in a number of the author's cases of malignant growths diathermy was used only as a last resort, the recorded results are remarkably good. The treatment of neoplasms of the bladder is described briefly. As has been shown in recent periodical literature, this is another field particularly suitable for the application of diathermy.

Dr. Simpson's monograph is an admirable account of our present-day knowledge of radium activity and radium therapy. The first hundred pages are devoted to a discussion of the chemical nature of radium, and radium disintegration products, of the production of radium emanation, and of the physical, chemical, and biological effects of radium rays. An extensive literature has been drawn upon in order to present an accurate idea of the effect of radium upon the body tissues. The following chapters, ten in number, are devoted to a discussion of therapeutic apparatus, the technique of application in different pathological conditions, and the results obtained as illustrated in the author's practice. A comprehensive bibliography completes the work.

The outstanding impression gained from reading Dr. Simpson's book are (1) the splendid results obtained in the treatment of epitheliomata about the mouth and face; (2) the good results obtained in the treatment of cervical uterine cancer; (3) the increasing tendency toward burying radium in the tissues, particularly in the form of radium emanation in glass ampoules.

Epitheliomata and benign new-growths of the skin, such as nævi, keloids, and tuberculous lesions, offer peculiarly favorable conditions for radium treatment, since it is possible definitely to concentrate the radium rays on the diseased tissue. The results of treatment of such lesions are well illustrated in Dr. Simpson's book.

Although the treatment of uterine cervical cancer with radium has not shown such brilliant success, the results compare so favorably with those of other methods of treatment that in certain clinics opera-

tive treatment has been abandoned in favor of radium treatment. This question is still a debatable one, and its settlement must wait on further evidence. The success attained in the treatment of uterine fibromyomata, in the leukæmic enlargements of the spleen, and in rapidly growing tumors of the teratoid type needs no comment.

The great problem in the treatment of malignant growths, that of the treatment of deeply situated tumors, is still a baffling one. The increasing tendency toward burying glass ampoules containing radium emanation, and leaving them *in situ* seems to us very suggestive. It is not too much to hope that in the near future some method may be devised of concentrating radium emanation in a container which will be slowly absorbed in the body tissues and thus permit the radiation of deep tumors as part of a single surgical procedure.

Dr. Schmitz' translation of Kroenig and Friedrich's monograph on *Radiation Therapy* will appeal particularly to workers and technicians in X-ray and radium therapy. A discussion of the problems involved in measuring X-ray dosage, emanating from a clinic which has commanded the resources of a well-equipped physical laboratory combined with the wealth of clinical material available at Freiburg, deserves the consideration of every worker in the field of radiation therapy.

Physical methods for estimating radiation energy, experimental determination of the amount of energy absorbed by living tissues, the relation of the hardness and intensity of the ray to the reaction produced, the importance and measurement of secondary radiations are some of the problems which are discussed, and toward whose solution the authors have contributed an important part.

The final answer as to the part radiation therapy may be expected to play in the battle against malignant disease rests on further careful and intensive studies of this type. SUMNER L. KOCH.

SUCCESSFUL surgery must be based upon the realization and appreciation of fundamental physiological and anatomical facts. The manner of success attained depends upon the establishment of function as nearly as possible approximating the normal. The surgery of the nervous system is in need of conscientious thorough investigations, both anatomical and physiological, which will form a firm and broad basis for the future development of sound surgical procedures. A volume such as the one under review, dedicated to setting forth the principles and methods whose foundations are laid in embryology, anatomy, and physiology, as well as in experimental and clinical facts should be met with an enthusiastic reception.

The author should be congratulated upon the incorporation of a chapter upon nerve degeneration and regeneration by such a recognized authority as Dr. Huber. The experimental work upon this subject is thoroughly reviewed and presented in a masterly fashion. It is representative of work upon which the future progress of neurologic surgery must depend.

The other portions of the book are devoted to a presentation of the anatomy and methods of approaching each of the important peripheral nerves as well as the frequently injured facial nerve. Methods of nerve repair are discussed and evaluated. The mechanical treatment of peripheral nerve injuries constitutes a most important rôle in the final functional result. Immobilization in a correct posture must be combined with efficient mobilization. In addition the evidence for and against the presence of a funicular arrangement of fibers in the nerve trunks and the importance of internal nerve plexuses are treated.

One wonders if the absence of cases illustrative of the various typical nerve injuries has not reduced the value of the book to the average general surgeon who might turn to it for aid. A combination of a clinical atlas and a volume such as the author has given us would seem to be ideal.

LOYAL E. DAVIS.

[1] SURGICAL AND MECHANICAL TREATMENT OF PERIPHERAL NERVES. By Byron Stookey, A.M., M.D., with a Chapter on Nerve Degeneration and Regeneration by G. Carl Huber, M.D. Philadelphia: W. B. Saunders Company, 1922.

AMERICAN COLLEGE OF SURGEONS

HOSPITAL STANDARDIZATION

FROM REPORT FOR 1922, INCLUDING LIST OF 1,012 GENERAL HOSPITALS OF 50 OR MORE BEDS IN THE UNITED STATES AND CANADA WHICH MEET THE MINIMUM STANDARD OF THE COLLEGE

A HIGH ideal of hospital service, a vision of community responsibility, a method by which this responsibility can be met efficiently day by day — this is Hospital Standardization. The following pages contain a report for 1922 of the progress of this movement — that of giving to the public the best service known to the science of medicine. It stands as a tribute to the idealism and the service of the combined medical and hospital professions.

For the past decade, American hospitals have been passing through a state of change. The development of modern surgery and medicine, the advancement in diagnostic procedure, the forward strides of pathology and roentgenology, made severe and confusing demands upon hospitals. In addition, medical men, hospital executives, and public health officials began to conceive of the hospital in a new light; that of an institution which centralizes in itself every department of modern medicine; which makes itself not only the clearing house for treatment, but also the headquarters for community health activities. Some such conception came to the minds of medical men and hospital executives, who were striving to give their communities the best in modern medicine. And this widening of responsibility was altogether natural. Hospitals, founded on a basis of service, had as their dominant motive the inherent desire to improve this service and to extend it to the entire community. The standardization program of the American College of Surgeons became the medium through which these ideals of the hospitals found adequate expression. It proposed a program of hospital service which voiced the needs and the ideals of hospitals themselves. Small wonder, then, that such a program has been adopted so rapidly. The soil had been prepared, the minimum standard was the seed, and better hospital service was the fruit thereof.

Hospitals ten years ago, as today, varied in size and scope from the clinical teaching organization of the large cities to the tiny hospital often owned and operated by a pioneer surgeon in an outlying town. Could every hospital irrespective of size and financial condition offer reliable, honest service to its patients? Were there any fundamentals for hospitals applicable to every type of institution found in the American continent?

The determination of these fundamentals and their practical application clearly constituted the first step toward improvement. By correspondence and by actual visits to hospitals, the leading medical and hospital minds of America attacked this problem.

These men were not idle theorists — rather they were successful medical men of broad vision and hospital executives who were coping with actual conditions day by day. After careful consideration they elaborated four fundamentals without which no institution is worthy of the name of hospital. Later these fundamentals became known as the Minimum Standard for hospital service, and under the leadership of the American College of Surgeons this standard has been adopted by the majority of hospitals of the United States and Canada.

The success of this movement is one of the most fascinating stories in the annals of American medicine.

ORIGIN OF THE PROGRAM

Soon after its organization, the American College of Surgeons felt the urgent need of improving hospital records, as applicants for admission to the College were required to submit as a part of their examination one hundred case records of major operations. These records were so incomplete and fragmentary in many instances that the College became thoroughly convinced of the necessity for a wide-spread campaign to improve them. This was the initial germ causing the hospital standardization movement; as it developed, other factors in hospital betterment presented themselves, such as the need for more adequate laboratory service and more efficient staff organization. Accordingly, hospital superintendents,

members of boards of trustees, and physicians of national repute were consulted in the endeavor to determine the best plan for instituting the necessary improvements.

Although, in general, the hospitals of the United States and Canada were very commendable institutions, no far-seeing individual could deny the existence of certain weaknesses which needed correction. It was decided in 1918, therefore, to send out questionnaires to all general hospitals in order to obtain complete information concerning the existing status of the following fundamentals: the type of staff organization, the extent to which hospital results were analyzed, the abolition of the practice of fee-division, the status of the case records, and the extent of the laboratory service. Replies to these questionnaires strengthened the growing conviction of the College that a personal survey of hospitals was imperative.

Next, a standard was needed upon which to base the survey, and leading authorities in the medical and hospital world were consulted further with this end in view. It was decided that the standard should be confined to the fundamentals which would insure the best hospital service; that it should be broad enough to be applicable to all general hospitals, and still detailed enough to avoid misinterpretation of the principles involved.

The hospital staff quite naturally was selected as the first essential to be considered in the standard. As a man often may be judged by the company he keeps, so also may a hospital be judged by the character and ability of its staff members. Restriction of staff membership to the ethical and competent, therefore, was admittedly necessary in order for a hospital to live up to its community trust. The necessity for some definite type of staff organization was mentioned because organization leads to efficiency, and lack of efficiency is inexcusable where human lives are concerned. The practice of fee-division was denounced as being absolutely incompatible with honest hospital and medical care; physicians buying and selling patients should have no place on a reputable hospital staff. Hospitals were urged to adopt a constitution and by-laws with specific reference to professional care, the keeping of records, and the attendance at staff meetings, because most hospital constitutions included no mention of such important essentials. Above all, the fundamental importance of regular staff conferences to analyze hospital results was especially emphasized. Failure to hold such meetings, besides being the chief reason for staff disharmony, was responsible for the lack of realizing the full benefit from the hospital's vast clinical experience.

The basic importance, also, of complete case records needed strong emphasis. Realizing that the majority of physicians kept relatively meagre office records, the hospital was considered the logical repository for the medical records of the community. It was a regrettable fact that many hospitals could furnish little evidence as to the amount of study made of each patient before treatment. From an economic standpoint alone, the value of the procedures carried on in the hospital was too great to permit of their being lost by failure of being recorded.

The rapid strides made by clinical and X-ray laboratories called for a more complete use of these important departments. There was a general deficiency in the quantity and variety of laboratory tests performed in hospitals. The operating room and pathological laboratory needed a closer correlation; each patient was entitled to more routine laboratory service.

With these considerations in view, the minimum standard was evolved in 1919. Whether it has stood the test of time is best answered by the fact that it has not been modified since its inception.

THE MINIMUM STANDARD

1. That physicians and surgeons privileged to practice in the hospital be organized as a definite group or staff. Such organization has nothing to do with the question as to whether the hospital is "open" or "closed," nor need it affect the various existing types of staff organization. The word *staff* is here defined as the group of doctors who practice in the hospital inclusive of all groups such as the "regular staff," the "visiting staff," and the "associate staff."

2. That membership upon the staff be restricted to physicians and surgeons who are (a) competent in their respective fields and (b) worthy in character and in matters of professional ethics; that in this latter connection the practice of the division of fees, under any guise whatever, be prohibited.

3. That the staff initiate and, with the approval of the governing board of the hospital, adopt rules, regulations, and policies governing the professional work of the hospital; that these rules, regulations, and policies specifically provide:

   a. That staff meetings be held at least once each month. (In large hospitals the departments may choose to meet separately.)

b. That the staff review and analyze at regular intervals the clinical experience of the staff in the various departments of the hospital, such as medicine, surgery, and obstetrics; the clinical records of patients, free and pay, to be the basis for such review and analysis.

4. That accurate and complete case records be written for all patients and filed in an accessible manner in the hospital, a complete case record being one, except in an emergency, which includes the personal history; the physical examination, with clinical, pathological, and X-ray findings when indicated; the working diagnosis; the treatment, medical and surgical; the medical progress; the condition on discharge with final diagnosis; and, in case of death, the autopsy findings when available.

5. That clinical laboratory facilities be available for the study, diagnosis, and treatment of patients, these facilities to include at least chemical, bacteriological, serological, histological, radiographic, and fluoroscopic service in charge of trained technicians.

Designed as a universal, as well as a minimum standard, it must be restricted to the basic principles underlying the best hospital service. There are many variable factors such as size, type, and location, which influence a hospital's procedure in carrying out certain policies. To meet these varying conditions, the standard omits any detailed description of how its principles should be enacted. It leaves this for each hospital to decide in accordance with local needs. Where there are several equally efficient means to an end, dogmatism in insisting upon one method hampers hospital initiative. This limitation to fundamentals, and avoidance of unnecessary detail, gives the standard sufficient elasticity to meet varying situations. The viewpoint of the College looks toward certain end-results, rather than upon specific methods to be used in securing such results.

The College recognizes the importance of many features not mentioned in its standard; these lack, however, sufficient uniformity in various hospitals, states, and provinces to warrant an equitable basis for comparison and rating. The published report of approved hospitals must be just. And the more complicated the standard, the greater will be the likelihood of error in selecting the list of institutions meeting it. It is believed, furthermore, that in the careful observance of all the principles of this standard, the various unmentioned features will be cared for automatically.

THE HOSPITAL STAFF

The first consideration in the minimum standard, and rightly so, is the hospital staff. It is unfortunately true that organization in hospital effort has not advanced to a degree comparable with its development in other technical lines. Surely there is no excuse for the human repair shop — the hospital — to fall behind in organization, always all important in promoting the highest efficiency. Responsibility for the various activities of the hospital must be centered in certain committees or individuals. The program for the staff meetings, the case records, the laboratory service, the nursing care, and the interne service, are but a few of the important activities, the responsibility for which should be centralized.

As the strength of a chain varies with its individual links, so the status of a hospital rises and falls with the strength or weakness of its component staff members. Restriction of hospital privileges to the ethical and competent, therefore, is essential.

The goal of the organized staff, and indeed the aim of the standardization program, is the analysis of the hospital's results. As expressed by Mr. John G. Bowman, "the staff meeting is the pivot upon which the success or failure of hospital standardization turns." It is the medium, through which this entire campaign finds expression. Without it, a hospital's efforts to a large degree fail.

The form of this analysis varies according to the type of organization. Whether combined staff meetings or departmental conferences are held is immaterial, so long as all the special activities of the hospital are represented.

The staff conference, perhaps more than any other factor, has improved the tone of hospital service during the past few years. It is the feeling of the College that these meetings should be devoted largely to a discussion of the so-called casualties, including deaths, infections, complications, and unimproved cases. Occasional hospitals still adhere to the belief that such meetings violate the confidential relationship existing between the physician and his patient. One naturally assumes that all the physicians present in a given staff meeting are ethical and competent; if not, they have no place on the hospital staff. Granting this assumption, all that occurs in this meeting is held in strict confidence by each physician present. The names of the patients are not divulged during the conference. The discussion is impersonal, being an analysis of a clinical event, and the relationship of that event to the hospital. Even if the patient's name be

known to a few, it should have no bearing subsequent to the meeting.

Experiences encountered in hospital practice probably exceed in value those occurring in any other line of endeavor, and their true value is not approached, unless they are portrayed in the staff conference. The confidential relationship between the physician and his patient is not violated; it is elevated to the much broader conception of a confidence reposed in a frank, co-operative group of fellow practitioners — the hospital staff.

LABORATORIES

One of the great advances in modern medicine has been in the direction of laboratory aid in diagnosis. Indeed, this constitutes one of the greatest distinctions between the practice of medicine today and that of our forefathers. Hospitals owe their patients the benefits of this advance in medical science. The laboratory in no sense, however, should be considered as a short-cut to diagnosis, supplanting the careful taking of a history and a painstaking physical examination. Combined with the latter, however, it furnishes an invaluable means of assistance, often making clear an otherwise obscure diagnosis.

The necessity, then, for making careful arrangements for adequate laboratory service, needs no argument. As a minimum, hospitals should have facilities for the examination of urine, blood, exudates, bacteriological slides, and for the growth of cultures. It may be impractical, however, for some hospitals to have equipment for the more technical examinations, such as serological and histological tests. Arrangements must be made with a reliable laboratory for accurate and prompt service for these more detailed examinations. Where material has to be sent outside of the hospital, there is an unfortunate tendency to reduce the number of specimens sent. As a result, laboratory service suffers. Unfortunately, the number of qualified pathologists and serologists is too small to supply each hospital individually, and as inaccurate laboratory reports are worse than none, the only recourse at the present time is the practice of sending certain specimens to adjacent laboratories.

To help obviate this difficulty it is customary to employ technicians. Adequate provision for their supervision, however, is often neglected. If a pathologist is not available, some staff member versed in laboratory work, should be selected for this purpose.

Even in hospitals with complete laboratory facilities, one frequently finds laboratory service markedly deficient, due to the insufficient quantity of tests performed, especially for private patients. This is due largely to two causes: first, the system of charging an individual fee for each test performed; and second, to the apathy of many staff members toward the laboratory. It cannot be too strongly emphasized that almost without exception, hospitals which charge individual fees for their laboratory tests, perform a relatively small number of tests per patient. Under such conditions, naturally, the hospital cannot assume a definite routine of laboratory service, as an immediate objection to the cost would be raised. The only solution apparent at the present time is the adoption of a flat-rate fee. This allows the hospital, and rightly, to assume the responsibility of having each patient receive adequate laboratory aid. The uniform success of this plan has been proved in so many instances, that it can be accepted as an established fact.

The installation of X-ray equipment has proceeded so rapidly that the supply of roentgenologists can scarcely meet the demand. Although technicians may become proficient in many phases of the work, the problem of adequate roentgenological interpretation is more difficult to meet. Each X-ray department should have a qualified roentgenologist in charge, if only in a part-time, supervisory capacity. Patients, in general, do not receive uniformly competent service if interpretations are relegated to individual physicians.

The College makes no specific recommendations concerning the number of routine laboratory examinations to be employed by hospitals. A routine urinalysis, of course, is performed in the majority of hospitals. Many perform a routine hæmoglobin determination and leucocyte count also—a practice to be strongly recommended. Some hospitals have a routine Wassermann test in certain wards or services. Fortunately, the practice of having a routine examination of every tissue removed in the operating room is becoming quite prevalent. This is a factor of paramount importance. Every specimen from the operating room should be sent to the laboratory automatically; this should be as rigid a part of the operating room technique as the sterilization of instruments. Every specimen should be examined by the pathologist, who submits at least a gross report of his examination and has a histological examination made whenever possible. Data of tremendous scientific value are becoming available due to the practice of sectioning practically all specimens from the operating room. Furthermore, this practice gives the hospital an insight into its operating room service that can be obtained in no other way.

CASE RECORDS

The absolute and fundamental importance of case records is a commonly acknowledged fact and needs no argument here. A careful study of the history of a patient's illness and a painstaking physical examination are procedures of such great importance that their value must be preserved. Failure to record these data, constitutes a tremendous economic loss and waste, to say nothing of the future bearing on the welfare and lives of the patients. How then, can the possession of a complete record system be facilitated? Its accomplishment requires the mutual co-operation of the hospital and its staff members.

The duties of the hospital in this connection consist, first of all, in supplying adequate personnel to secure the records. In the absence of internes, record clerks are essential. Even the small hospital is entitled to a full-time historian, although it is quite common for these historians to devote part of their time to other activities of the hospital. It is because the responsibilities and many duties of the historian are so little realized that so small an amount of time is allotted to her. With careful training she can record many of the essential points of the personal history; the physical examination records should be taken by dictation from the physicians. This relieves the staff members of considerable time and labor. In addition, the historian should keep close watch of the current records to see that they are recorded promptly; she notes whether the history, physical examination record, and working diagnosis are recorded before operations; she keeps in close touch with the progress notes, which explain the course of the patient's illness; and she checks over the records carefully to see that they are complete before filing.

An efficient record committee is a necessary adjunct to the historian's work. In this committee is vested the responsibility for the interpretation of the records. Other of its functions are a persuasive stimulation of the physicians to improve their records; a periodical review of the charts of the discharged patients; and the selection of the records to be analyzed at the staff conference.

Many hospitals fail to provide adequate space for the record department. For this purpose a room large enough to contain the records of many years should be set aside, adjacent to the hospital office. All plans for new hospitals should bear this important feature in mind. This department should contain standard filing cabinets and card indices for names and diseases; for each record must be immediately accessible. The cost of this equipment is slight in proportion to the value received; perhaps no expenditure is more warranted.

After supplying the equipment and personnel needed for a modern record department, the hospital can expect the physicians to insure the accuracy of the records. Although much of the time and labor in securing records can be borne by the hospital, the responsibility for the records themselves lies with the physicians. Unless constantly checked and supervised by the staff members, the records will contain many inaccuracies. In many small hospitals the physicians write all the records personally. Whether recorded by internes, historians, or dictated to clerks, however, the physicians should scrutinize the records closely and signify their approval in writing before the charts are filed. Physicians too often take no interest in the records of their patients written by internes; as a result, the records are frequently inaccurate and brief. Staff supervision is a great stimulus to internes, the character of whose work reflects the interest displayed in it by the staff members.

Personal study in over sixteen hundred hospitals during the past four years has shown a progressive improvement in the records. Certain prevalent shortcomings, however, are worthy of special emphasis. Extreme brevity is a common fault, coupled with a tendency to dismiss important regions of the body from consideration by too promiscuous use of the words "normal," or "negative." A tendency to a stereotyped form of history and physical examination record is encountered frequently. Such charts have little individuality or clinical value and result from two causes: failure to record the data until shortly before or after the patient's discharge; and from lack of supervision of the records by the hospital staff.

The importance of having the working diagnosis recorded early is insufficiently realized. This, in itself, will correct many existing difficulties in connection with other phases of the records. Operation records are almost universally weak in describing the exploratory findings and operative technique. The solution for this seems to be the dictation of these data during or immediately following each operation.

Case records are not to be filed and forgotten; if so, most of their potential value is lost. Inseparably linked with the staff conference, the records form the only basis for a true analysis of a hospital's results. The depth of this analysis varies in direct proportion with the detail and completeness of the records. Many treasures are

buried in hospital record rooms for lack of discovery and analysis. Unquestionably, one of the greatest future advances in hospitals will be in the direction of statistical, analytical research based on complete records.

THE METHOD AND RESULTS OF THE SURVEYS

The hospital surveys of the College are *personal* surveys. Experience has shown that a study of hospital conditions through correspondence and questionnaires leads to many inaccuracies. The College surveys are conducted through a trained corps of hospital visitors, all of whom are graduates in medicine. The number of visitors employed in any year has never exceeded ten. Since the uniformity of a survey varies in inverse proportion with the number of men employed, by using relatively few visitors, all similarly trained, the College obtains strictly uniform reports. As an additional safeguard, each visitor covers a large number of states and provinces in order that he may obtain a general, rather than a local viewpoint of hospital conditions. This uniformity in the reports is an absolute essential to a just rating of hospitals. Upon such detailed personal surveys, the College is dependent for an accurate estimate of each hospital's status relative to the minimum standard.

The purpose of the visitors is to explain the minimum standard, to interpret its application to each hospital, and to offer constructive criticism and helpful suggestions to remedy any existing shortcomings. This campaign is one of suggestion only; there is no element of coercion entailed. It succeeds through the sanction and approval of the hospitals themselves.

Other organizations interested in hospital betterment have played a prominent rôle in advancing hospital standardization. The program of the College has been enhanced greatly by the endorsement of such organizations as the American Hospital Association, the American Conference on Hospital Service, the Canadian Medical Association, the Catholic Hospital Association, the Conference Board of Hospitals and Homes of the Methodist Church, the Medical and Surgical Section of the American Railway Association, the Methodist Hospital Association, the Protestant Hospital Association, and numerous state, provincial, and local organizations.

Internes and nurses are using the approved list of the College as a guide in the selection of institutions in which to pursue their training. The public is making increasing use of it as a means of determining which institutions offer safe and competent hospital care. Benevolent foundations employ it in deciding upon hospitals which are worthy of financial aid. The American Railway Association has recommended that all railroad employees, wherever possible, be treated in hospitals meeting the minimum standard. The United States Government, in its selection of hospitals for the treatment of its disabled veterans, utilizes the information furnished through the surveys and approved lists of the College.

Four annual surveys of the general hospitals in the United States and Canada have been made. Of the institutions having one hundred or more beds, 89 were found to meet the standard in 1918; in 1919, 198 fulfilled the requirements; in 1920, 407 or 57 per cent met the standard; in 1921 the number of approved hospitals grew to 579 or 76 per cent; and this year 677 or 83 per cent of the 812 hundred bed general hospitals are on the approved list.

Of the 811 general hospitals having a capacity of between fifty and one hundred beds, 335 or 41 per cent are approved, an excellent showing in view of the fact that previous lists published by the College have not included these smaller institutions.

Grouping together the 1623 general hospitals having fifty or more beds, there are 1012 or 62 per cent meeting the requirements of the standard.

THE FIFTY BED HOSPITALS

Although the College has been surveying the smaller hospitals since 1920, it was deemed advisable to withhold their publication on the approved list until sufficient time had elapsed to give them an opportunity to familiarize themselves thoroughly with the standardization program.

The smaller hospitals are under greater difficulties than the larger institutions. Many are forced to be practically self-supporting; the physicians are more prone to develop personal rivalries which retard staff organization; it is difficult for them to obtain internes; and sufficient laboratory service is often a serious problem. In spite of these difficulties, however, the small hospitals have welcomed the minimum standard with the same spirit manifested by the large institutions. Indeed, it is in these small hospitals where the greatest change in hospital service has been manifested. It requires patience to establish a complete case record system; to organize a harmoniously functioning staff; and to arrange for adequate laboratory service. These small institutions are to be especially commended, therefore, on the excellent showing which they have made.

In the United States and Canada there are 811 general hospitals having between fifty and one hundred beds. Of these, 335 or 41 per cent are on the approved list. This exceeds the percentage of hundred bed hospitals which met with approval at the time of the first survey.

The surveys of the College have demonstrated that the hospitals of this continent are receptive to any means of improving their service to the public. As the sphere of hospitals has widened, so have their responsibilities increased. Sensing these ever deepening responsibilities and obligations, hospitals looked forward to a means of satisfying their broadened conception and ideals of community service. The minimum standard and the standardization program of the College furnished a concrete method by which these aspirations could be reached. The future will see the further elaboration by hospitals of the principles of the minimum standard, and a fuller realization of the spirit embodied therein.

LIST OF APPROVED HOSPITALS[1]

Capacity of 50 Beds and Over

The following list contains the names of those general hospitals of fifty or more beds, in the United States and Canada, which meet the minimum standard. In this list a certain number of the institutions are designated with an asterisk. This group includes those hospitals which, when visited, had adopted the fundamental principles of the minimum standard, but which at that time had not developed all of them to a degree meriting the fullest approval. The hospitals listed without an asterisk have received the benefits of a longer experience in the workings of the program and consequently a broader conception of its application.

UNITED STATES

ALABAMA

100 or more beds

*Birmingham Baptist Hospital, Birmingham
Employees Hospital, T. C. I. & R. R. Co., Birmingham
Hillman Hospital, Birmingham
Mobile City Hospital, Mobile
*Norwood Hospital, Birmingham
*Providence Infirmary, Mobile
*St. Vincent's Hospital, Birmingham
South Highlands Infirmary, Birmingham

50 to 100 beds

*Alabama Baptist Hospital, Selma
*John A. Andrew Memorial Hospital, Tuskegee
Vaughan Memorial Hospital, Selma

ARIZONA

100 or more beds

*St. Joseph's Hospital, Phoenix

ARKANSAS

100 or more beds

Logan H. Roots Memorial Hospital, Little Rock
St. Louis Southwestern Hospital, Texarkana
St. Vincent's Hospital, Little Rock
*Sparks Memorial Hospital, Fort Smith

50 to 100 beds

Baptist State Hospital, Little Rock
*Leo N. Levi Memorial Hospital, Hot Springs
Michael Meagher Memorial Hospital, Texarkana
St. Bernard's Hospital, Jonesboro
St. Luke's Hospital and Annex, Little Rock

CALIFORNIA

100 or more beds

Alameda County Hospital, San Leandro
Children's Hospital, Los Angeles
Children's Hospital, San Francisco
*French Hospital, San Francisco
*Fresno County Hospital, Fresno
*Golden State Hospital, Los Angeles
Hospital of the Good Samaritan, Los Angeles
Lane Hospital, San Francisco
*Loma Linda Sanitarium and Hospital, Loma Linda
Los Angeles County Hospital, Los Angeles
Mary's Help Hospital, San Francisco
Mt. Zion Hospital, San Francisco
*O'Connor Sanitarium, San Jose
Pasadena Hospital, Pasadena
Providence Hospital, Oakland
*Sacramento Hospital, Sacramento
St. Francis Hospital, San Francisco
St. Joseph's Hospital, San Diego
St. Joseph's Hospital, San Francisco
St. Mary's Hospital, San Francisco
St. Vincent's Hospital, Los Angeles
San Diego County Hospital, San Diego
San Francisco Hospital, San Francisco
*San Joaquin General Hospital, French Camp
Santa Barbara Cottage Hospital, Santa Barbara
Santa Clara County Hospital, San Jose
Santa Fe Coast Lines Hospital, Los Angeles
Southern Pacific Hospital, San Francisco
University of California Hospital, San Francisco
White Memorial Hospital, Los Angeles

50 to 100 beds

*Mercy Hospital, Bakersfield
*Murphy Memorial Hospital, Whittier
*Paradise Valley Sanitarium, National City
*Ramona Hospital, San Bernardino
*St. Francis Hospital, Santa Barbara

[1]This list is complete only to October 6, 1922, when this bulletin went to press. Any subsequent changes, if necessary, will appear in the bulletin on hospital standardization which will appear in January, 1923.

COLORADO

100 or more beds

Children's Hospital, Denver
Glockner Sanatorium, Colorado Springs
Mercy Hospital, Denver
Minnequa Hospital, Pueblo
St. Anthony's Hospital, Denver
St. Francis Hospital, Colorado Springs
*St. Joseph's Hospital, Denver
*St. Luke's Hospital, Denver
St. Mary's Hospital, Pueblo

50 to 100 beds

*Denver and Rio Grande Western Railroad Hospital, Salida
*Red Cross Hospital, Salida

CONNECTICUT

100 or more beds

Bridgeport Hospital, Bridgeport
Grace Hospital, New Haven
Greenwich General Hospital, Greenwich
Hartford Hospital, Hartford
*Hospital of St. Raphael, New Haven
Lawrence and Memorial Associated Hospitals, New London
New Haven Hospital, New Haven
St. Francis Hospital, Hartford
St. Mary's Hospital, Waterbury
St. Vincent's Hospital, Bridgeport
*Stamford Hospital, Stamford
Waterbury Hospital, Waterbury

50 to 100 beds

New Britain General Hospital, New Britain

DELAWARE

100 or more beds

Delaware Hospital, Wilmington

50 to 100 beds

*Homeopathic Hospital, Wilmington

DISTRICT OF COLUMBIA

100 or more beds

Central Dispensary and Emergency Hospital, Washington
Children's Hospital, Washington
Columbia Hospital for Women, Washington
Freedman's Hospital, Washington
Garfield Memorial Hospital, Washington
George Washington University Hospital, Washington
Georgetown University Hospital, Washington
Providence Hospital, Washington
*Washington Sanitarium and Hospital, Washington

FLORIDA

100 or more beds

*Duval County Hospital, Jacksonville
*St. Luke's Hospital, Jacksonville

50 to 100 beds

Gordon Keller Memorial Hospital, Tampa
*Miami City Hospital, Miami

GEORGIA

100 or more beds

*Davis-Fischer Sanatorium, Atlanta
Georgia Baptist Hospital, Atlanta
Grady Memorial Hospital, Atlanta
Harbin Hospital, Rome
Piedmont Sanatorium, Atlanta
*St. Joseph's Infirmary, Atlanta
University Hospital, Augusta

50 to 100 beds

*Athens General Hospital, Athens
*Downey Hospital, Gainesville
*Park View Sanitarium, Savannah
Scottish Rite Hospital, Decatur

IDAHO

100 or more beds

St. Alphonsus Hospital, Boise

50 to 100 beds

Pocatello General Hospital, Pocatello
*Providence Hospital, Wallace
St. Anthony's Hospital, Pocatello
*St. Luke's Hospital, Boise

ILLINOIS

100 or more beds

Alexian Brothers Hospital, Chicago
Augustana Hospital, Chicago
Chicago Lying-in Hospital, Chicago
Children's Memorial Hospital, Chicago
Columbus Hospital, Chicago
Cook County Hospital, Chicago
Evanston Hospital, Evanston
*Frances E. Willard Hospital, Chicago
Grant Hospital, Chicago
Hahnemann Hospital, Chicago
*Hinsdale Sanitarium, Hinsdale
*Hospital of St. Anthony de Padua, Chicago
Illinois Central Hospital, Chicago
*Illinois Charitable Eye and Ear Infirmary, Chicago
*Lake View Hospital, Danville
Lutheran Deaconess Hospital, Chicago
Mercy Hospital, Chicago
Michael Reese Hospital, Chicago
Misericordia Hospital, Chicago
Mt. Sinai Hospital, Chicago
Presbyterian Hospital, Chicago
Rockford Hospital, Rockford
St. Anne's Hospital, Chicago
St. Bernard's Hospital, Chicago
*St. Elizabeth's Hospital, Chicago
*St. Elizabeth's Hospital, Danville
St. Francis Hospital, Blue Island
St. Francis Hospital, Evanston
St. Francis Hospital, Peoria
St. Joseph's Hospital, Chicago
*St. Joseph's Hospital, Joliet
St. Luke's Hospital, Chicago
*St. Mary's Hospital, East St. Louis
St. Mary's Hospital, LaSalle
*St. Mary's Infirmary, Cairo
St. Mary of Nazareth Hospital, Chicago
South Shore Hospital, Chicago
Swedish Covenant Hospital, Chicago
University Hospital, Chicago
*Washington Park Hospital, Chicago
Wesley Memorial Hospital, Chicago

50 to 100 beds

*Columbus Extension Hospital, Chicago
*Garfield Park Hospital, Chicago
Huber Memorial Hospital, Pana
Illinois Masonic Hospital, Chicago
*Lake View Hospital, Chicago
*Lutheran Hospital, Moline
North Chicago Hospital, Chicago
Olney Sanitarium, Olney
Our Saviour's Hospital, Jacksonville
Passavant Memorial Hospital, Jacksonville
*Post-Graduate Hospital, Chicago
*Provident Hospital, Chicago
St. Andrew's Hospital, Murphysboro
*St. Francis Hospital, Freeport
*South Side Hospital, Chicago
Washington Boulevard Hospital, Chicago

INDIANA

100 or more beds

Fort Wayne Lutheran Hospital, Fort Wayne
Gary Hospital, Gary
Indianapolis City Hospital, Indianapolis
Methodist Episcopal Hospital, Indianapolis
Robert W. Long Hospital, Indianapolis
St. Anthony's Hospital, Terre Haute
St. Elizabeth's Hospital, LaFayette
St. Joseph's Hospital, Fort Wayne
St. Margaret's Hospital, Hammond
St. Mary's Hospital, Evansville
St. Mary's Mercy Hospital, Gary
St. Vincent's Hospital, Indianapolis

50 to 100 beds

Epworth Hospital, South Bend
*Holy Family Hospital, LaPorte
LaFayette Home and Hospital, LaFayette
Muncie Home Hospital, Muncie
*Protestant Deaconess Home and Hospital, Evansville
*Reid Memorial Hospital, Richmond
St. Joseph's Hospital, South Bend
*Union Hospital, Terre Haute
Walker Hospital, Evansville

IOWA

100 or more beds

Finley Hospital, Dubuque
Iowa Lutheran Hospital, Des Moines
Iowa Methodist Hospital, Des Moines
Jennie Edmundson Hospital, Council Bluffs
Mercy Hospital, Cedar Rapids
Mercy Hospital, Council Bluffs
Mercy Hospital, Davenport
*Mercy Hospital, Des Moines
St. Francis Hospital, Waterloo
St. Joseph's Mercy Hospital, Dubuque
St. Joseph's Mercy Hospital, Sioux City
St. Vincent's Hospital, Sioux City
University Hospital, Iowa City

50 to 100 beds

*Iowa Congregational Hospital, Des Moines
*Iowa State College Hospital, Ames
*Lutheran Hospital, Sioux City
*Ottumwa Hospital, Ottumwa
Park Hospital, Mason City
St. Joseph's Mercy Hospital, Clinton
St. Joseph's Mercy Hospital, Fort Dodge
St. Joseph's Mercy Hospital, Mason City
*St. Joseph's Mercy Hospital, Waverly
*Samaritan Hospital, Sioux City

KANSAS

100 or more beds

Bethany Methodist Hospital, Kansas City
St. Francis Hospital, Wichita
St. Margaret's Hospital, Kansas City
*Wichita Hospital, Wichita

50 to 100 beds

Axtell Hospital, Newton
Bell Memorial Hospital, Kansas City
Halstead Hospital, Halstead
Hutchinson Methodist Hospital, Hutchinson
*Mercy Hospital, Fort Scott
*Mt. Carmel Hospital, Pittsburg
Providence Hospital, Kansas City
*St. Elizabeth's Hospital, Hutchinson
St. Francis Hospital, Topeka
St. John's Hospital, Salina
*St. Joseph's Hospital, Concordia

KENTUCKY

100 or more beds

Good Samaritan Hospital, Lexington
Louisville City Hospital, Louisville
Norton Memorial Hospital, Louisville
St. Anthony's Hospital, Louisville
*St. Elizabeth's Hospital, Covington
SS. Elizabeth and Mary Hospital, Louisville
St. Joseph's Hospital, Lexington
St. Joseph's Infirmary, Louisville

50 to 100 beds

*Booth Memorial Hospital, Covington
*Children's Free Hospital, Louisville
*Deaconess Hospital, Louisville
Illinois Central Hospital, Paducah
*Jewish Hospital, Louisville

LOUISIANA

100 or more beds

Charity Hospital, New Orleans
Hotel Dieu, New Orleans
*Presbyterian Hospital, New Orleans
St. Francis Sanitarium, Monroe
T. E. Schumpert Memorial Hospital, Shreveport
Touro Infirmary, New Orleans

50 to 100 beds

*Illinois Central Railroad Hospital, New Orleans
*North Louisiana Sanitarium, Shreveport

MAINE

100 or more beds

Eastern Maine General Hospital, Bangor
*Maine General Hospital, Portland
*St. Mary's General Hospital, Lewiston

50 to 100 beds

*Children's Hospital, Portland

MARYLAND

100 or more beds

*Allegany Hospital, Cumberland
Bay View City Hospital, Baltimore
Church Home and Infirmary, Baltimore
Franklin Square Hospital, Baltimore
Hebrew Hospital and Asylum, Baltimore
Hospital for Women of Maryland, Baltimore
Johns Hopkins Hospital, Baltimore
Maryland General Hospital, Baltimore
Mercy Hospital, Baltimore
Morrow Hospital, Baltimore
St. Agnes Hospital, Baltimore
St. Joseph's Hospital, Baltimore
Union Memorial Hospital, Baltimore
University Hospital, Baltimore

50 to 100 beds

Children's Hospital School, Baltimore
Emergency Hospital, Easton
Frederick City Hospital, Frederick
South Baltimore General Hospital, Baltimore

MASSACHUSETTS

100 or more beds

Beverly Hospital, Beverly
Boston City Hospital, Boston
Brockton Hospital, Brockton
*Burbank Hospital, Fitchburg
Cambridge City Hospital, Cambridge
Cambridge Hospital, Cambridge
Carney Hospital, Boston
Children's Hospital, Boston
City Hospital, Fall River
*Cooley-Dickinson Hospital, Northampton
Free Hospital for Women, Boston
Holyoke City Hospital, Holyoke
House of Mercy Hospital, Pittsfield
Lawrence General Hospital, Lawrence
Long Island Hospital, Boston
Lowell Corporation Hospital, Lowell
Lowell General Hospital, Lowell
Lynn Hospital, Lynn
*Malden Hospital, Malden
Massachusetts Charitable Eye and Ear Infirmary, Boston
Massachusetts General Hospital, Boston
Massachusetts Homeopathic Hospital, Boston
Memorial Hospital, Worcester
Mercy Hospital, Springfield
New England Hospital for Women and Children, Boston
Newton Hospital, Newton Lower Falls
*Noble Hospital, Westfield
Peter Bent Brigham Hospital, Boston
Providence Hospital, Holyoke
St. Elizabeth's Hospital, Boston
St. John's Hospital, Lowell
*St. Luke's Hospital, New Bedford
St. Vincent's Hospital, Worcester
Salem Hospital, Salem
Springfield Hospital, Springfield
Union Hospital, Fall River
*Waltham Hospital, Waltham
*Wesson Memorial Hospital, Springfield
Worcester City Hospital, Worcester

50 to 100 beds

Beth Israel Hospital, Boston
Boston Lying-in Hospital, Boston
Clinton Hospital, Clinton
Farren Memorial Hospital, Montague City
*Faulkner Hospital, Boston
*Hart Private Hospital, Brookline
House of the Good Samaritan, Boston
Infants' Hospital, Boston
North Adams Hospital, North Adams
*Quincy City Hospital, Quincy
Truesdale Hospital, Fall River

MICHIGAN

100 or more beds

Battle Creek Sanitarium, Battle Creek
Blodgett Memorial Hospital, Grand Rapids
Butterworth Hospital, Grand Rapids
Children's Free Hospital, Detroit
Detroit Receiving Hospital, Detroit
*Edward W. Sparrow Hospital, Lansing
*Evangelical Deaconess Hospital, Detroit
Grace Hospital, Detroit
Hackley Hospital, Muskegon
Harper Hospital, Detroit
Henry Ford Hospital, Detroit
Highland Park General Hospital, Highland Park
House of Providence, Detroit
*Hurley Hospital, Flint
Mercy Hospital, Bay City
*New Borgess Hospital, Kalamazoo
*Old Borgess Hospital, Kalamazoo
St. Joseph's Hospital, Ann Arbor
St. Mary's Hospital, Detroit
St. Mary's Hospital, Grand Rapids
University Hospital, Ann Arbor
W. A. Foote Memorial Hospital, Jackson
Woman's Hospital and Infants' Home, Detroit

50 to 100 beds

*Bronson Methodist Hospital, Kalamazoo
*Detroit Eye, Ear, Nose, and Throat Hospital, Detroit
*Ishpeming Hospital, Ishpeming
Memorial Hospital, Owosso
Mercy Hospital, Jackson
*Nichols Memorial Hospital, Battle Creek
Saginaw General Hospital, Saginaw
St. Mary's Hospital, Saginaw
Samaritan Hospital, Detroit

MINNESOTA

100 or more beds

*Abbott Hospital, Minneapolis
Bethesda Hospital, St. Paul
*Charles T. Miller Hospital, St. Paul
City and County Hospital, St. Paul
Colonial Hospital, Rochester
Deaconess Hospital, Minneapolis
*Eitel Hospital, Minneapolis
Fairview Hospital, Minneapolis
Minneapolis General Hospital, Minneapolis
Minnesota State Hospital for Indigent Children, St. Paul
Mounds Park Sanitarium, St. Paul
Northern Pacific Beneficial Association Hospital, St. Paul
Northwestern Hospital, Minneapolis
St. Barnabas Hospital, Minneapolis
St. Joseph's Hospital, St. Paul
*St. Luke's Hospital, Duluth
*St. Luke's Hospital, St. Paul
St. Mary's Hospital, Duluth
St. Mary's Hospital, Minneapolis
St. Mary's Hospital, Rochester

St. Paul Hospital, St. Paul
Swedish Hospital, Minneapolis
University of Minnesota Hospital, Minneapolis
Worrell Hospital, Rochester

50 to 100 beds

Hill Crest Surgical Hospital, Minneapolis
*Immanuel Hospital, Mankato
*St. Gabriel's Hospital, Little Falls
St. John's Hospital, St. Paul
*St. Joseph's Hospital, Mankato
St. Raphael's Hospital, St. Cloud

MISSISSIPPI

100 or more beds

East Mississippi Charity Hospital, Meridian

MISSOURI

100 or more beds

Alexian Brothers Hospital, St. Louis
Barnes Hospital, St. Louis
Children's Hospital, Kansas City
Christian Church Hospital, Kansas City
*Evangelical Deaconess Home and Hospital, St. Louis
Frisco Employees Hospital, St. Louis
*Grace Hospital, Kansas City
Jewish Hospital, St. Louis
Kansas City General Hospital, Kansas City
Lutheran Hospital, St. Louis
Missouri Baptist Sanitarium, St. Louis
Missouri Pacific Railroad Hospital, St. Louis
Research Hospital, Kansas City
St. Anthony's Hospital, St. Louis
St. John's Hospital, St. Louis
St. Joseph's Hospital, Kansas City
St. Louis Children's Hospital, St. Louis
St. Louis City Hospital, St. Louis
St. Louis Mullanphy Hospital, St. Louis
St. Luke's Hospital, St. Louis
St. Mary's Hospital, Kansas City
St. Mary's Infirmary, St. Louis

50 to 100 beds

Bethesda Hospital, St. Louis
*Frisco Employees Hospital, Springfield
*Parker Memorial Hospital, Columbia
*St. Francis Hospital, Cape Girardeau
St. Francis Hospital, Maryville
St. John's Hospital, Joplin
St. Luke's Hospital, Kansas City
St. Mary's Hospital, Jefferson City
Trinity Lutheran Hospital, Kansas City
University Hospital, Kansas City

MONTANA

100 or more beds

Columbus Hospital, Great Falls
Montana Deaconess Hospital, Great Falls
Murray Hospital, Butte
St. James Hospital, Butte
*St. Patrick's Hospital, Missoula

50 to 100 beds

*Bozeman Deaconess Hospital, Bozeman
*Northern Pacific Beneficial Association Hospital, Missoula
*St. Ann's Hospital, Anaconda
*St. Joseph's Hospital, Lewistown
St. Vincent's Hospital, Billings

NEBRASKA

100 or more beds

Nebraska Methodist Episcopal Hospital, Omaha
St. Elizabeth's Hospital, Lincoln
St. Francis Hospital, Grand Island
St. Joseph's Hospital, Omaha
St. Mary's Hospital, Columbus
University of Nebraska Hospital, Omaha

50 to 100 beds

*Immanuel Deaconess Hospital, Omaha
Presbyterian Hospital, Omaha
*Swedish Mission Hospital, Omaha

NEVADA

50 to 100 beds

*Elko General Hospital, Elko

NEW HAMPSHIRE

100 or more beds

St. Joseph's Hospital, Nashua

50 to 100 beds

*Elliott Hospital, Manchester
*Hospital of Notre Dame, Manchester
Mary Hitchcock Memorial Hospital, Hanover
Nashua Memorial Hospital, Nashua

NEW JERSEY

100 or more beds

Alexian Brothers Hospital, Elizabeth
Atlantic City Hospital, Atlantic City
Bayonne Hospital and Dispensary, Bayonne
Christ Hospital, Jersey City
Cooper Hospital, Camden
Elizabeth General Hospital, Elizabeth
Englewood Hospital, Englewood
Hackensack Hospital, Hackensack
Jersey City Hospital, Jersey City
Mercer Hospital, Trenton
Monmouth Memorial Hospital, Long Branch
Morristown Memorial Hospital, Morristown
Mountainside Hospital, Montclair
Muhlenberg Hospital, Plainfield
Newark Beth Israel Hospital, Newark
Newark City Hospital, Newark
Newark Memorial Hospital, Newark
*Newark Presbyterian Hospital, Newark
Orange Memorial Hospital, Orange
Passaic General Hospital, Passaic
Paterson General Hospital, Paterson
St. Elizabeth's Hospital, Elizabeth
St. Francis Hospital, Jersey City
St. Francis Hospital, Trenton
*St. Joseph's Hospital, Paterson
*St. Mary's Hospital, Hoboken
*St. Michael's Hospital, Newark
*St. Peter's General Hospital, New Brunswick

50 to 100 beds

Ann May Memorial Hospital, Spring Lake
*Homeopathic Hospital, Newark
*Hospital and Home for Crippled Children, Newark
*Hospital for Women and Children, Newark
*Middlesex General Hospital, New Brunswick
Nathan and Miriam Barnert Memorial Hospital, Paterson
*St. James Hospital, Newark

NEW YORK

100 or more beds

Albany Hospital, Albany
*Arnot-Ogden Memorial Hospital, Elmira
Bellevue Hospital, New York
Beth Israel Hospital, New York
Beth Moses Hospital, Brooklyn
*Binghamton City Hospital, Binghamton
Broad Street Hospital, New York
Brooklyn Hospital, Brooklyn
Brownsville and East New York Hospital, Brooklyn
Buffalo City Hospital, Buffalo
Buffalo General Hospital, Buffalo
Buffalo Hospital of Sisters of Charity, Buffalo
*Bushwick Hospital, Brooklyn
Carson C. Peck Memorial Hospital, Brooklyn
Children's Hospital, Buffalo
Clifton Springs Sanitarium, Clifton Springs
Community Hospital, New York
Coney Island Hospital, Brooklyn
Cumberland Street Hospital, Brooklyn
Ellis Hospital, Schenectady
Flower Hospital, New York
Flushing Hospital and Dispensary, Flushing
Fordham Hospital, New York
French Benevolent Society Hospital, New York
Gouverneur Hospital, New York
Greenpoint Hospital, Brooklyn
Hahnemann Hospital, New York
Harlem Hospital, New York
Highland Hospital, Rochester
Holy Family Hospital, Brooklyn
Homeopathic Hospital, Albany
Hospital of the Good Shepherd, Syracuse
Jewish Hospital, Brooklyn
Kings County Hospital, Brooklyn
Lebanon Hospital, New York
Lenox Hill Hospital, New York
Lincoln Hospital, New York
Long Island College Hospital, Brooklyn
Manhattan Eye, Ear, and Throat Hospital, New York
Memorial Hospital, New York
Methodist Episcopal Hospital, Brooklyn
Metropolitan Hospital, New York
Misericordia Hospital, New York
Montifiore Hospital, New York
Mt. St. Mary's Hospital, Niagara Falls
Mt. Sinai Hospital, New York
Mt. Vernon Hospital, Mt. Vernon
New York City Hospital, Blackwell's Island, New York
*New York Eye and Ear Infirmary, New York
New York Foundling Home, New York
New York Hospital, New York
New York Hospital for Ruptured and Crippled, New York
New York Infirmary for Women and Children, New York
New York Nursery and Children's Hospital, New York
New York Orthopedic Hospital, New York
New York Post-Graduate Hospital, New York
New York Skin and Cancer Hospital, New York
*New York State Hospital, West Haverstraw
Niagara Falls Memorial Hospital, Niagara Falls
Norwegian Lutheran Deaconess Hospital, Brooklyn
Oneida County Hospital, Rome
Presbyterian Hospital, New York
Rochester General Hospital, Rochester
Rochester Homeopathic Hospital, Rochester
Roosevelt Hospital, New York
St. Catherine's Hospital, Brooklyn
St. Francis Hospital, New York
St. John's Brooklyn Hospital, Brooklyn
St. John's Hospital, Long Island
St. John's Riverside Hospital, Yonkers
*St. Joseph's Hospital, Syracuse
St. Luke's Hospital, New York
St. Mark's Hospital, New York
St. Mary's Free Hospital for Children, New York
*St. Mary's Hospital, Brooklyn
St. Mary's Hospital, Rochester
St. Peter's Hospital, Albany
St. Peter's Hospital, Brooklyn
St. Vincent's Hospital, New York
Samaritan Hospital, Troy
Sloane Hospital for Women, New York
Staten Island Hospital, Tompkinsville
Syracuse Memorial Hospital, Syracuse
Troy Hospital, Troy
Women's Hospital, New York
Wyckoff Heights Hospital, Brooklyn
Yonkers Homeopathic Hospital and Maternity, Yonkers

50 to 100 beds

Anthony N. Brady Maternity Hospital, Albany
*Auburn City Hospital, Auburn
Babies Hospital, New York
Broad Street Hospital, Oneida
Columbus Extension Hospital, New York
Columbus Hospital, New York
Emergency Hospital of Sisters of Charity, Buffalo
Faxton Hospital, Utica
*Frederick Ferris Thompson Hospital, Canandaigua
*General Hospital, Syracuse
Geneva City Hospital, Geneva
Glens Falls Hospital, Glens Falls
*Harbor Hospital, Brooklyn
Jamaica Hospital, Jamaica
Jewish Maternity Hospital, New York
Knickerbocker Hospital, New York
Lawrence Hospital, Bronxville
Mary Immaculate Hospital, Jamaica
Mary McClellan Hospital, Cambridge
*Nassau Hospital, Mineola, Long Island
*Nathan Littauer Hospital, Gloversville
New Rochelle Hospital, New Rochelle
Ossining Hospital, Ossining
Park Avenue Clinical Hospital, Rochester
Peoples Hospital, New York
*Prospect Heights Hospital, Brooklyn
Reconstruction Hospital, New York
St. Bartholomew's Hospital, New York
St. Christopher's Hospital for Babies, Brooklyn
St. Vincent's Hospital, West New Brighton
Saratoga Hospital, Saratoga Springs
*Swedish Hospital, Brooklyn
Williamsburg Hospital, Brooklyn

NORTH CAROLINA

100 or more beds

*James Walker Memorial Hospital, Wilmington
*Presbyterian Hospital, Charlotte
*St. Leo's Hospital, Greensboro
Watts Hospital, West Durham

50 to 100 beds

*Asheville Mission Hospital, Asheville
Atlantic Coast Lines Railroad Hospital, Rocky Mount
Burrus-McCain Hospital, Highpoint
City Memorial Hospital, Winston-Salem

Highsmith Hospital, Fayetteville
*Long's Sanitarium, Statesville
Park View Hospital, Rocky Mount
Rutherford Hospital, Rutherfordton
*Salisbury Hospital, Salisbury

NORTH DAKOTA

100 or more beds

Bismarck Evangelical Deaconess Hospital, Bismarck
*Grand Forks Deaconess Hospital, Grand Forks
St. Alexius Hospital, Bismarck
St. John's Hospital, Fargo
St. Luke's Hospital, Fargo

50 to 100 beds

*St. Joseph's Hospital, Minot
St. Michael's Hospital, Grand Forks

OHIO

100 or more beds

*Aultman Hospital, Canton
Bethesda Hospital, Cincinnati
Christ Hospital, Cincinnati
Cincinnati General Hospital, Cincinnati
City Hospital, Akron
Cleveland City Hospital, Cleveland
Good Samaritan Hospital, Cincinnati
Good Samaritan Hospital, Zanesville
Grant Hospital, Columbus
Hawkes Hospital of Mt. Carmel, Columbus
Huron Road Hospital, Cleveland
Jewish Hospital, Cincinnati
Lakeside Hospital, Cleveland
Lucas County Hospital, Toledo
Mercy Hospital, Hamilton
Mercy Hospital, Toledo
Miami Valley Hospital, Dayton
Mt. Sinai Hospital, Cleveland
*Peoples Hospital, Akron
Protestant Hospital, Columbus
St. Alexis Hospital, Cleveland
St. Elizabeth's Hospital, Dayton
St. Elizabeth's Hospital, Youngstown
St. Francis Hospital, Columbus
St. John's Hospital, Cleveland
*St. Joseph's Hospital, Lorain
St. Luke's Hospital, Cleveland
St. Mary's Hospital, Cincinnati
St. Rita's Hospital, Lima
St. Vincent's Hospital, Cleveland
St. Vincent's Hospital, Toledo
Springfield City Hospital, Springfield
Toledo Hospital, Toledo
University Homeopathic Hospital, Columbus
Youngstown Hospital, Youngstown

50 to 100 beds

*Alliance City Hospital, Alliance
Bellaire City Hospital, Bellaire
Bethesda Hospital, Zanesville
Children's Hospital, Columbus
Children's Hospital and Mary Day Nursery, Akron
Deaconess Hospital, Cincinnati
*Fairview Park Hospital, Cleveland
Flower Hospital, Toledo
Glenville Hospital, Cleveland
*Good Samaritan Hospital, Sandusky
Lakewood Hospital, Cleveland
*Lima Hospital, Lima
Mansfield General Hospital, Mansfield
*Massillon City Hospital, Massillon
Maternity and Children's Hospital, Toledo
*Memorial Hospital, Fremont
Mercy Hospital, Canton
Mercy Hospital, Columbus
*Newark City Hospital, Newark
Robinwood Hospital, Toledo
St. Ann's Infant Asylum and Maternity Hospital, Cleveland
Salem Hospital, Salem
Scarlet Oaks Sanitarium, Cincinnati
Schirrman Hospital, Portsmouth
*Warren City Hospital, Warren

OKLAHOMA

100 or more beds

St. Anthony's Hospital, Oklahoma City
State University Hospital, Oklahoma City

50 to 100 beds

*Wesley Hospital, Oklahoma City

OREGON

100 or more beds

Emanuel Hospital, Portland
Good Samaritan Hospital, Portland
*Hot Lake Sanatorium, Hot Lake
St. Vincent's Hospital, Portland

50 to 100 beds

*Portland Sanitarium, Portland
Portland Surgical Hospital, Portland
*Sacred Heart Hospital, Medford

PENNSYLVANIA

100 or more beds

Allegheny General Hospital, Pittsburgh
Allentown Hospital, Allentown
Altoona Hospital, Altoona
Braddock General Hospital, Braddock
Chester County Hospital, West Chester
Chester Hospital, Chester
Children's Homeopathic Hospital, Philadelphia
Children's Hospital, Pittsburgh
Clearfield Hospital, Clearfield
Columbia Hospital, Pittsburgh
Conemaugh Valley Memorial Hospital, Johnstown
Easton Hospital, Easton
Elizabeth Steel Magee Hospital, Pittsburgh
Frankford Hospital, Philadelphia
George F. Geisinger Hospital, Danville
Germantown Dispensary and Hospital, Philadelphia
Hahnemann Hospital, Scranton
Hahnemann Medical and Surgical Hospital, Philadelphia
Hamot Hospital, Erie
Harrisburg Hospital, Harrisburg
Homeopathic Medical and Surgical Hospital, Pittsburgh
Hospital of the Protestant Episcopal Church, Philadelphia
Hospital of the University of Pennsylvania, Philadelphia
Hospital of the Women's Medical College, Philadelphia
J. Lewis Crozer Hospital, Chester
Jefferson Medical College Hospital, Philadelphia
Jewish Hospital, Philadelphia
Lancaster General Hospital, Lancaster
Lankenau Hospital, Philadelphia
*McKeesport Hospital, McKeesport

Medico-Chirurgical Hospital, Philadelphia
Memorial Hospital, Philadelphia
Mercy Hospital, Johnstown
*Mercy Hospital, Philadelphia
Mercy Hospital, Pittsburgh
Mercy Hospital, Wilkes-Barre
Methodist Episcopal Hospital, Philadelphia
Misericordia Hospital, Philadelphia
Moses Taylor Hospital, Scranton
Mt. Sinai Hospital, Philadelphia
Passavant Hospital, Pittsburgh
Pennsylvania Hospital, Philadelphia
Philadelphia General Hospital, Philadelphia
Philadelphia Polyclinic Hospital, Philadelphia
Pittsburgh Hospital, Pittsburgh
Pottsville Hospital, Pottsville
Presbyterian Hospital, Philadelphia
Presbyterian Hospital, Pittsburgh
Reading Hospital, Reading
Robert Packer Hospital, Sayre
Sacred Heart Hospital, Allentown
St. Agnes Hospital, Philadelphia
St. Francis Hospital, Pittsburgh
St. John's General Hospital, Pittsburgh
St. Joseph's Hospital, Lancaster
St. Joseph's Hospital, Philadelphia
St. Joseph's Hospital, Pittsburgh
St. Joseph's Hospital, Reading
St. Luke's Hospital, South Bethlehem
St. Margaret's Hospital, Pittsburgh
St. Mary's Hospital, Philadelphia
St. Vincent's Hospital, Erie
Samaritan Hospital, Philadelphia
South Side Hospital, Pittsburgh
*State Hospital for Injured Persons, Ashland
State Hospital of Middle Coal Fields, Hazelton
State Hospital of Northern Anthracite Coal Regions, Scranton
Washington Hospital, Washington
Western Pennsylvania Hospital, Pittsburgh
Wilkes-Barre City Hospital, Wilkes-Barre
Wills Hospital, Philadelphia
Women's Homeopathic Hospital, Philadelphia
Women's Hospital, Philadelphia
York Hospital and Dispensary, York

50 to 100 beds

Abington Memorial Hospital, Abington
*Bainbridge Private Hospital, Philadelphia
Bryn Mawr Hospital, Bryn Mawr
Carlisle Hospital, Carlisle
Chestnut Hill Hospital, Philadelphia
Children's Hospital, Philadelphia
Children's Hospital of the Mary J. Drexel Home, Philadelphia
Citizens General Hospital, New Kensington
Gynecean Hospital, Philadelphia
Howard Hospital, Philadelphia
Indiana Hospital, Indiana
J. C. Blair Memorial Hospital, Huntingdon
*Jewish Maternity Hospital, Philadelphia
*Joseph Price Memorial Hospital, Philadelphia
*Mercy Hospital, Altoona
Monongahela Memorial Hospital, New Eagle
Montefiore Hospital, Pittsburgh
*Northwestern General Hospital, Philadelphia
Oil City Hospital, Oil City
Palmerton Hospital, Palmerton
Philadelphia Lying-in Charity Hospital, Philadelphia
Preston Retreat Hospital, Philadelphia
*Providence Hospital, Beaver Falls
St. Christopher's Hospital for Children, Philadelphia
St. Luke's Homeopathic Hospital, Philadelphia
St. Vincent's Hospital for Women and Children, Philadelphia
*State Hospital of Nanticoke, Nanticoke
Stetson Hospital, Philadelphia
Suburban General Hospital, Bellevue
West Philadelphia Hospital for Women, Philadelphia

RHODE ISLAND

100 or more beds

*Newport Hospital, Newport
Rhode Island Hospital, Providence
St. Joseph's Hospital, Providence

50 to 100 beds

Memorial Hospital, Pawtucket
Providence Lying-in Hospital, Providence

SOUTH CAROLINA

100 or more beds

Chick Springs Sanitarium, Chick Springs
*Columbia Hospital, Columbia
Florence Infirmary, Florence
*Greenville City Hospital, Greenville
Roper Hospital, Charleston

50 to 100 beds

*Anderson County Hospital, Anderson
Baker Sanatorium, Charleston
St. Francis Xavier Infirmary, Charleston

SOUTH DAKOTA

100 or more beds

McKennan Hospital, Sioux Falls
St. Luke's Hospital, Aberdeen

50 to 100 beds

Lincoln Hospital, Aberdeen
Methodist State Hospital, Mitchell
New Madison Hospital, Madison
*St. Joseph's Hospital, Deadwood
St. Mary's Hospital, Pierre

TENNESSEE

100 or more beds

Baptist Memorial Hospital, Memphis
Erlanger Hospital, Chattanooga
*George W. Hubbard Hospital, Nashville
*Knoxville General Hospital, Knoxville
Memphis General Hospital, Memphis
Nashville City Hospital, Nashville
St. Joseph's Hospital, Memphis
St. Thomas Hospital, Nashville
Vanderbilt University Hospital, Nashville

50 to 100 beds

Baird-Dulaney Hospital, Dyersburg
*Fort Sanders Hospital, Knoxville
Newell and Newell Sanitarium, Chattanooga
Women's Hospital of State of Tennessee, Nashville

TEXAS

100 or more beds

Baptist Hospital, Houston
Baylor Hospital, Dallas
Central Texas Baptist Sanitarium, Waco

Hotel Dieu, Beaumont
John Sealy Hospital, Galveston
Parkland Hospital, Dallas
Providence Sanitarium, Waco
Robert B. Green Memorial Hospital, San Antonio
St. Joseph's Infirmary, Fort Worth
St. Joseph's Infirmary, Houston
St. Mary's Infirmary, Galveston
St. Paul's Sanitarium, Dallas
Santa Rosa Infirmary, San Antonio
*Santa Fe Hospital, Temple
Temple Sanitarium, Temple

50 to 100 beds

All Saints Hospital, Fort Worth
Harris Sanitarium, Fort Worth
*Johnson and Beall's Hospital, Forth Worth
King's Daughters' Hospital, Temple
St. Joseph's Infirmary, Paris

UTAH

100 or more beds

Dr. W. H. Groves Latter Day Saints Hospital, Salt Lake City
Holy Cross Hospital, Salt Lake City
St. Mark's Hospital, Salt Lake City
*Thomas D. Dee Memorial Hospital, Ogden

VERMONT

100 or more beds

Mary Fletcher Hospital, Burlington

50 to 100 beds

Fanny Allen Hospital, Winooski
Heaton Hospital, Montpelier
*Rutland Hospital, Rutland

VIRGINIA

100 or more beds

*Chesapeake and Ohio Hospital, Clifton Forge
Hospital Division of Medical College of Virginia, Richmond
Norfolk Protestant Hospital, Norfolk
St. Vincent's Hospital, Norfolk
Stuart Circle Hospital, Richmond
University of Virginia Hospital, Charlottesville

50 to 100 beds

Elizabeth Buxton Hospital, Newport News
Jefferson Hospital, Roanoke
Johnston-Willis Sanitarium, Richmond
*King's Daughters' Hospital, Staunton
Lake View Hospital, Suffolk
Lewis-Gale Hospital, Roanoke
*Riverside Hospital, Newport News
St. Elizabeth's Hospital, Richmond
St. Luke's Hospital, Richmond
Sarah Leigh Hospital, Norfolk

WASHINGTON

100 or more beds

Children's Orthopedic Hospital, Seattle
Columbus Sanitarium, Seattle
King County Hospital, Seattle
Maria Beard Deaconess Hospital, Spokane
*Northern Pacific Hospital, Tacoma
Providence Hospital, Seattle
Sacred Heart Hospital, Spokane
St. Elizabeth's Hospital, North Yakima
St. Joseph's Hospital, Tacoma
St. Luke's Hospital, Spokane
St. Mary's Hospital, Walla Walla
Seattle City Hospital, Seattle
Seattle General Hospital, Seattle
Swedish Hospital, Seattle
Tacoma General Hospital, Tacoma

50 to 100 beds

*Minor Hospital, Seattle
*St. Joseph's Hospital, Aberdeen
Virginia Mason Hospital, Seattle

WEST VIRGINIA

100 or more beds

Charleston General Hospital, Charleston
Kessler-Hatfield Hospital, Huntington
Ohio Valley Hospital, Wheeling
St. Mary's Hospital, Clarksburg
Sheltering Arms Hospital, Hansford
*Welch Hospital No. 1, Welch
Wheeling Hospital, Wheeling

50 to 100 beds

*Beckley Hospital, Beckley
*Bluefield Sanitarium, Bluefield
*Chesapeake and Ohio Hospital, Huntington
Coal Valley Hospital, Montgomery
Davis Memorial Hospital, Elkins
*Guthrie Hospital, Huntington
*McKendree Hospital No. 2, McKendree
*St. Luke's Hospital, Bluefield

WISCONSIN

100 or more beds

LaCrosse Lutheran Hospital, LaCrosse
Luther Hospital, Eau Claire
Madison General Hospital, Madison
Mercy Hospital, Janesville
Milwaukee County Hospital, Milwaukee
Milwaukee Hospital, Milwaukee
Mt. Sinai Hospital, Milwaukee
St. Agnes Hospital, Fond du Lac
St. Francis Hospital, LaCrosse
St. Joseph's Hospital, Marshfield
St. Joseph's Hospital, Milwaukee
St. Mary's and Mercy Hospitals, Oshkosh
St. Mary's Hospital, Green Bay
*St. Mary's Hospital, Milwaukee
*St. Mary's Hospital, Superior
Trinity Hospital, Milwaukee

50 to 100 beds

Columbia Hospital, Milwaukee
*Evangelical Deaconess Hospital, Milwaukee
Grandview Hospital, LaCrosse
*Holy Family Hospital, Manitowoc
*LaCrosse Public Hospital, LaCrosse
Milwaukee Children's Hospital, Milwaukee
*Milwaukee Maternity and General Hospital, Milwaukee
*Misericordia Hospital, Milwaukee
St. Elizabeth's Hospital, Appleton
St. Joseph's Hospital, Dodgeville
St. Mary's Hospital, Madison
St. Mary's Hospital, Racine

WYOMING

50 to 100 beds

*Wheatland Hospital, Wheatland

CANADA

ALBERTA

100 or more beds

General Hospital, Calgary
General Hospital, Edmonton
Holy Cross Hospital, Calgary
Medicine Hat Hospital, Medicine Hat
Misericordia Hospital, Edmonton
Royal Alexandra Hospital, Edmonton

50 to 100 beds

*Galt Hospital, Lethbridge
Lamont Public Hospital, Lamont

BRITISH COLUMBIA

100 or more beds

Provincial Royal Jubilee Hospital, Victoria
Royal Columbian Hospital, New Westminster
Royal Inland Hospital, Kamloops
St. Joseph's Hospital, Victoria
St. Paul's Hospital, Vancouver
Vancouver General Hospital, Vancouver

50 to 100 beds

*Vernon Jubilee Hospital, Vernon

MANITOBA

100 or more beds

Brandon General Hospital, Brandon
Children's Hospital, Winnipeg
Misericordia Hospital, Winnipeg
St. Boniface Hospital, St. Boniface
Winnipeg General Hospital, Winnipeg

50 to 100 beds

*Victoria Hospital, Winnipeg

NEW BRUNSWICK

100 or more beds

General Public Hospital, St. John

50 to 100 beds

*Chipman Memorial Hospital, St. Stephen
Hotel Dieu, Campbellton
Hotel Dieu, Chatham
Miramichi Hospital, Newcastle
Moncton Hospital, Moncton
St. John's Infirmary, St. John
Victoria Public Hospital, Fredericton

NOVA SCOTIA

100 or more beds

St. Joseph's Hospital, Glace Bay
Salvation Army Maternity Hospital, Halifax
Victoria General Hospital, Halifax

50 to 100 beds

Aberdeen Hospital, New Glasgow
Children's Hospital, Halifax
*General Hospital, Glace Bay
Highland View Hospital, Amherst
*St. Martha's Hospital, Antigonish

ONTARIO

100 or more beds

Carleton County Protestant General Hospital, Ottawa
General Hospital, Kingston
General Hospital, Toronto
Grace Hospital, Toronto
Hamilton City Hospital, Hamilton
Hotel Dieu, Kingston
McKellar General Hospital, Ft. William
Ottawa General Hospital, Ottawa
St. Joseph's Hospital, Hamilton
*St. Joseph's Hospital, London
St. Joseph's Hospital, Port Arthur
St. Luke's Hospital, Ottawa
St. Michael's Hospital, Toronto
Sick Children's Hospital, Toronto
Victoria Hospital, London
*Western Hospital, Toronto

50 to 100 beds

*General Hospital, Brockville
*General Hospital, Sault Ste. Marie
Niagara Falls General Hospital, Niagara Falls
*Nicholls Hospital, Peterborough
*St. Francis Hospital, Smith's Falls
*St. Joseph's Hospital, Peterborough
*St. Vincent de Paul Hospital, Brockville
*Smith's Falls Public Hospital, Smith's Falls
*Welland County Hospital, Welland
Wellesley Hospital, Toronto
Women's College Hospital, Toronto

PRINCE EDWARD ISLAND

50 to 100 beds

Charlottetown Hospital, Charlottetown
Prince Edward Island Hospital, Charlottetown

QUEBEC

100 or more beds

Children's Memorial Hospital, Montreal
General de St. Vincent Hospital, Sherbrooke
Hotel Dieu, Montreal
Jeffery Hale's Hospital, Quebec
Montreal General Hospital, Montreal
Notre Dame Hospital, Montreal
Royal Victoria Hospital, Montreal
Sainte Justine Pour Les Enfants, Montreal
*Western Hospital, Montreal

50 to 100 beds

Montreal Maternity Hospital, Montreal
*Sherbrooke Hospital, Sherbrooke

SASKATCHEWAN

100 or more beds

Grey Nuns Hospital, Regina
Regina General Hospital, Regina
St. Paul's Hospital, Saskatoon
Saskatoon City Hospital, Saskatoon

50 to 100 beds

Holy Family Hospital, Prince Albert
*Notre Dame Hospital, North Battleford
*Prince Albert Municipal Hospital (Victoria Hospital), Prince Albert
Providence Hospital, Moose Jaw

GROUP MEETINGS OF STATE AND PROVINCIAL SECTIONS OF THE CLINICAL CONGRESS OF THE AMERICAN COLLEGE OF SURGEONS, SEPTEMBER, 1922

THE Autumn sectional meetings of the American College of Surgeons were held from September 1 to September 12 in Winnipeg, Regina, Tacoma and Salt Lake City. All of these meetings were well attended and there was abundant evidence of growing interest and enthusiasm in the program of the College. Not only was the interest shown by the Fellows of the College, but as well by other members of the profession, those interested in hospitals, and the public. The surgical clinics and scientific meetings appealed to the professional man interested in the scientific practice of surgery. The hospital conferences were a direct stimulus to those interested in the improvement and establishment of the highest standards of efficiency and public service in our hospitals. The public meetings were the means of setting before the people the standards of healthful living and the methods for attaining those standards. There was a direct appeal for a strong co-operation of all agencies toward better health.

Those taking part in the September tour of 1922 were Dr. Franklin H. Martin, Director-General; Dr. Malcolm T. MacEachern; Dr. Frederic A. Besley; Dr. Robert E. McKechnie; Reverend C. B. Moulinier, S.J., and Dr. D. A. Craig.

The general program for the public meetings, with the exception of a few alterations, was as follows:

The Meaning of the American College of Surgeons to the Public. Franklin H. Martin, M.D., Director-General, American College of Surgeons.

The Hospital Standardization Program of the American College of Surgeons. Malcolm T. MacEachern, A.M., M.D., Ottawa, Ontario. Associate Director for Canadian Activities, American College of Surgeons.

What the Public Should Know about Cancer. Robert E. McKechnie, M.D., C.M., Vancouver, B. C. Consulting Surgeon, Vancouver General Hospital.

Experimental Medicine. Frederic A. Besley, M.D., Chicago, Illinois. Professor of Surgery, Northwestern University Medical School.

Better Hospitals. Reverend C. B. Moulinier, S.J., Milwaukee, Wisconsin. President, Catholic Hospital Association.

Modern Public Health. D. A. Craig, M.D., Halifax, Nova Scotia. Canadian Red Cross Society, Nova Scotia Division.

The general program for the Hospital Conferences follows:

The Hospital Program of the American College of Surgeons. Franklin H. Martin, M.D.

Hospital Standardization from the Surgeon's Standpoint. Robert E. McKechnie, M.D., C.M., Vancouver, B. C. Frederic A. Besley, M.D., Chicago, Illinois.

Hospital Standardization from the Patient's Standpoint. D. A. Craig, M.D., Halifax, Nova Scotia.

Hospital Standardization from the Hospital Superintendent's Standpoint. Local Hospital Superintendent.

The Soul of Hospital Standardization. Reverend C. B. Moulinier, S.J., Milwaukee, Wisconsin.

Hospital Standardization in Canada. Malcolm T. MacEachern, M.D., Ottawa, Ontario.

Round Table Discussion: Led by Malcolm T. MacEachern, M.D.

Manitoba Section

The Manitoba sectional meeting of the American College of Surgeons was held in Winnipeg on Friday and Saturday, September 1 and 2. There was a large attendance from various parts of the Province. Much of the success of the meetings was due to the energetic work of the local committee which put forth every effort to make the program interesting and instructive to all those in attendance.

The hospital standardization meeting was held in the Medical Building of the University of Manitoba at 2:00 p.m. on the first day. There was a large attendance of physicians, nurses, sisters, and all those interested in hospitals. Dr. J. A. Gunn, chairman of the Manitoba Executive Committee of the American College of Surgeons, presided. The general program for hospital meetings was carried out, with the addition of a short address on "Hospital Standardization from the Standpoint of the Hospital Superintendent," by Dr. G. F. Stephens, superintendent of the Winnipeg General Hospital.

Following the hospital meeting a Round Table Conference was conducted by Dr. Malcolm T. MacEachern. At this conference many important points concerning hospital management were brought up for discussion.

The public meeting was held in the Central Congregational Church at 8:00 p.m., and, al-

though the weather was not favorable, there was a large and enthusiastic attendance.

Dr. J. A. Gunn presided, and after a few opening remarks called upon the Mayor of the city, who extended a hearty welcome to the representatives and Fellows of the College attending the meetings. His Worship also expressed himself as heartily in accord with the movement for better hospitals, better medical service, and better health.

The clinics conducted at the hospitals during the meetings were well attended and showed evidence of scientific interest and effort on the part of those conducting them. At one o'clock on the afternoon of the second day the scientific meeting was held at the Manitoba Medical School. A series of excellent papers was presented and there was much discussion. The program was as follows:

Intestinal Tuberculosis. (Illustrated.) David A. Stewart, M.D., Superintendent, Ninette Sanitarium, Ninette, Manitoba.
The Problem of Sarcoma of the Extremities from the Surgeon's Viewpoint. (Illustrated.) Frederic A. Besley, M.D., Chicago, Illinois.
Arteriomesenteric Ileus. James McKenty, M.D., Winnipeg.
Operative Obstetrics. H. M. Little, M.D., C.M., Montreal, Quebec. Associate Professor of Gynecology and Obstetrics, McGill University.
Discussion on Papers.
Closing Remarks. Franklin H. Martin, M.D., Chicago, Illinois.
Adjournment.

Saskatchewan and Alberta Section

On September 4 and 5, the Saskatchewan and Alberta sectional meetings were held in Regina. The usual procedure was carried out with regard to the program. Dr. Andrew Croll of Saskatoon, the local chairman, presided at the meetings.

At the afternoon hospital conference, besides the prescribed program, Dr. M. R. Bow, superintendent of the Regina Hospital, gave an interesting talk on Hospital Standardization from the Hospital Superintendent's Viewpoint.

The public meeting was held in the City Hall. There was a large and interested audience. At this meeting Dr. Robert E. McKechnie of Vancouver, a member of the Board of Regents of the College, was present and gave an instructive address on "What the Public Should Know about Cancer." All the Regina meetings and clinics were well attended by representatives from both the Provinces of Alberta and Saskatchewan.

Washington, British Columbia, Oregon, and Idaho Section

The sectional meeting for Washington, British Columbia, Oregon, and Idaho was held in Tacoma on September 8 and 9. The general sessions were conducted at the Scottish Rite Cathedral and the clinics at the Tacoma General and St. Joseph's Hospitals. The committee meetings were held at the Tacoma Hotel. Dr. John B. McNerthney, the Washington chairman, presided at the general meetings. Besides the usual afternoon program of the hospital conference, there was a short organ recital by Mr. Clayton Johnson. The hospital superintendent's viewpoint of standardization was discussed by Mr. C. J. Cumming, superintendent of the Tacoma General Hospital. Mr. W. F. Geiger, superintendent of public schools for the city of Tacoma, introduced a new and exceedingly commendable idea. He described how the scheme of hospital standardization had been communicated to the children in the public schools of the city of Tacoma. The children had been taught something of the history of hospitals, the purpose for which they were built and conducted, their value in the community, and the difference between an efficient hospital and one which was not up to standard. Mr. Geiger's efforts in this regard were an innovation and called forth much favorable commendation.

The evening public meeting at Tacoma was the largest of the series. The Scottish Rite Cathedral was packed to the doors and many stood in the entrances and at the back of the gallery during the entire meeting. The usual evening program was carried out and was received with splendid enthusiasm by the large audience. The clinics and the scientific sessions were well attended and showed evidence of careful preparation by those taking part in them. At Tacoma, the representatives of the College were exceedingly fortunate in having the opportunity of meeting Mr. S. M. Jackson, who is head of the Board of Trustees of the Tacoma General Hospital, and to whose energetic efforts the excellent standard of that hospital at the present time is largely due.

Utah, Colorado and Wyoming Section

The sectional meeting for the States of Utah, Colorado, and Wyoming was held in Salt Lake City on September 11 and 12. The meetings, with the exception of the hospital clinics, were held in the Utah Hotel, and were all well attended. Dr. Frederick Stauffer of Salt Lake City, local chairman, presided at the general meetings.

The usual program of the evening meeting was augmented by an excellent address from Judge Harold M. Stephens of Salt Lake City on "The Public Value of Professional Organization." The program of the scientific meeting held at the Utah Hotel was as follows:

Postoperative Thrombosis of the Veins of the Leg. J. E. Tyree, M.D., Salt Lake City.

Complications and Mortality Causes, Following Prostatectomy. W. G. Schulte, M.D., Salt Lake City.

The Value of Muscle Transplantation in the Correction of Ocular Movements. Edward Jackson, M.D., Denver, Colorado.

Sarcoma of the Extremities from the Surgeon's Viewpoint. Frederic A. Besley, M.D., Chicago, Illinois.

All these papers were very interesting, instructive, and well prepared, and were productive of considerable discussion.

At the hospital conference, Mr. B. F. Grant, superintendent of the Latter Day Saints Hospital, Salt Lake City, discussed the superintendent's standpoint of standardization.

September Sectional Meetings

The September sectional meetings of the American College of Surgeons were without doubt a definite proof of the value of the work of the College and the place which it is assuming in the public mind today. It is a definite proof to the public that the medical profession is interested in better public service on the part of our hospitals and on the part of the profession. The movement for better health in which the medical profession is anxious and willing to cooperate with other agencies is one of the biggest features of the program of the American College of Surgeons, and one which the members of the College will exert every effort to carry through to a successful issue.

Everywhere the Director-General and his staff were shown the kindliest hospitality. All those taking part in the meetings returned to their homes feeling that not only had these meetings been interesting and instructive from a scientific and professional point of view, but that they had served as well to establish a spirit of friendship and unity between the members of the College, the medical profession, and the public at large.

Coming Meetings

Illinois at Quincy, December 1–2.

Indiana at Evansville, December 4–5.

Ohio and Michigan at Cincinnati, December 8–9.